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#4291

A MANUAL

ON

EXTRACTING TEETH.

FOUNDED ON THE ANATOMY OF THE PARTS INVOLVED IN THE OPERATION; THE KINDS AND PROPER CONSTRUCTION OF THE INSTRUMENTS TO BE USED; THE ACCIDENTS LIABLE TO OCCUR FROM THE OPERATION, AND THE PROPER REMEDIES TO RETRIEVE SUCH ACCIDENTS.

BY

ABRAHAM ROBERTSON, D.D.S., M.D.,

Author of Prize Essay on Extracting Teeth, etc.; Fellow of the N. H. Medical Society; Corresponding Member of the Odontographic Society of Pennsylvania; Honorary Member of the New York Dental Society; Honorary Member of the Merrimac Valley Dental Society; Honorary Member of the Maine Dental Society.

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TO

B. FORDYCE BARKER, M.D.,

THE EMINENT PHYSICIAN,

THE LEARNED AND ELOQUENT PROFESSOR,

AS A TESTIMONIAL OF RESPECT FOR HIS ERUDITION AND SKILL,

THIS LITTLE VOLUME

IS AFFECTIONATELY INSCRIBED

BY HIS FRIEND,

THE AUTHOR.

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PREFACE.

The operation of extracting teeth being at best a painful one, and one to which almost every individual of the more than thirty millions of inhabitants of this country, as well as a large share of the remaining one thousand millions of the human race are necessarily subjected, and millions of them many times each; the interests, the comfort of humanity demand that those who perform the operation should be so instructed as to be able to do it in the most skilful manner. And, strange as it may seem, the author of this is not aware that there is any work, in any language, devoted exclusively to that subject. All, so far as he knows, that has

been written on the subject, being comprised in a few minor articles in the dental journals, and an occasional chapter in treatises on practical dentistry—works but little likely to fall into the hands of the great mass of those whose duty requires them to perform this operation.

Having for a long time felt the necessity of such a work, by having seen the evil consequences to patients for want of skill on the part of the operator; and having often experienced, in his early career, the anxiety and trepidation of being obliged to perform operations in the principles of which he was not fully instructed, the author, after an experience of many years, has, in this little manual, undertaken to set forth, as clearly as possible, all the principles involved in the operation; as well as the necessary manipulations required; founded on the anatomy of the parts concerned; the proper construction of the appropriate instru-

ments to be used; and the best means of retrieving the accidents liable to occur in performing the operation.

If in this undertaking it shall prove that he has contributed something toward the relief of the pains and sufferings of humanity, he will congratulate himself with the belief that he has not lived and labored in vain.

ABR. ROBERTSON.

A TREATISE

ON

EXTRACTING TEETH.

CHAPTER I.

INTRODUCTORY REMARKS.

The operation of extracting decayed and painful teeth, has been performed, in some manner, from very remote antiquity. At first, and for many ages, for want of the necessary anatomical knowledge, and probably for various other reasons, it was performed with very unsuitable instruments and in the roughest and most barbarous manner. Justice also compels us to admit that but comparatively slight improvements had been made, either in the instruments used in the operation or in the manner of using them, till after the lapse of the first quarter of the present century, although great advances had been made in the knowledge of anatomy previous to that time. And we are compelled, in honesty and

in sorrow, further to say, that very many still, who extract teeth, have made but very little advance on the most primitive instruments or the application of them, although the anatomy of the human system has now been studied, almost to the counting of the hairs and fibres of the whole organization. This may probably be accounted for from the fact that anatomy has not been studied with especial reference to this particular object. But another and a stronger reason is, that in times past, and not very remote, extracting teeth, with bleeding, cupping, and leeching, and, indeed, most other surgical operations, was consigned to the care of barbers, as not worthy the attention of learned physicians. From this degradation it has not yet altogether recovered. But, happily for humanity, it is not now generally considered beneath the dignity of the wisest and the best, to do anything that will relieve suffering mortals from the severest torments "to which flesh is heir."

But, as what has been done badly, or is badly done, has but little to do with what should be done well, or is well done, we will spend no time in describing either those primitive instruments or the primitive manner of using them. The curious can find them described in other volumes.

But, as this operation is more frequently performed than any, or all other surgical operations combined,

almost every individual in this country of mature age, having been obliged to submit to it more or less repeatedly, and, as it is usually accompanied with more dread than any other operation of equal importance, and as it is always (unless anæsthetics are used) a painful operation; and when unskilfully performed, a very painful one, and sometimes even a dangerous one, it is therefore important that it should always be done in the most careful and skilful manner. What we now propose to do, is to describe and illustrate the instruments best adapted to the perfect accomplishment of the object under consideration,—the entire removal of every tooth and root of a tooth that requires extraction, with the least exertion, with the least amount of force by the operator, with the least possible injury to the surrounding parts, and consequently with the least amount of present pain and after-suffering to the patient, and the most appropriate methods of applying and using such instruments to effect such results.

But, before attempting to use or to apply any instruments for the extraction of the teeth, preliminary knowledge is indispensably requisite; to wit: a distinct and definite knowledge of the anatomy of the teeth, in at least so far as their external forms and articulations are concerned, and of the jaws, their articulations and appendages. A knowledge, too, of

the pathology of the teeth is no less necessary and indispensable rightly to qualify one to perform the duties of this branch of surgery.

A knowledge of anatomy can best be acquired in the dissecting-room; and perfectly only there. The author would therefore most urgently recommend to every one who intends devoting himself to the alleviation of the pains of his fellow-beings by extracting their teeth, there to seek this knowledge; for without it, sad mistakes and injuries are liable to be committed with the very best of instruments.

This knowledge is necessary, not only to enable one to know when and how to operate, and to guard against the occurrence of accidents and injuries, but if, as is sometimes unavoidably the case in the hands of the most skilful,—an accident does happen, it is still more necessary to enable him to make the best possible amends. For a knowledge of the anatomy of the parts involved, is the foundation of all surgery, and the only thing that enables one knowingly, and therefore the most effectually, to repair such accidents.

Since then a knowledge of the anatomy of the teeth is a *sine qua non* in even learning to extract them, and as all may not be able to study it in the dissecting-room, we will devote a preliminary chapter to that subject.

CHAPTER II.

ANATOMY OF THE JAWS AND TEETH.

Sec. 1. The jaws are two, upper and lower (or superior and inferior). The upper jaw, entire, is composed of the two superior maxillary bones which unite at the medial line of the face. They each consist of what is called a body and four processes—the nasal, malar, alveolar, and palate processes—and give form to the anterior middle portion of the face, and help to form the nose, the orbit, the cheek, and the palate. The body of the bone is of an irregular triangular form. Its interior is hollowed into a large triangular, but in size and form irregular, cavity called the antrum maxillare, or antrum highmorianum; on the internal surface of which are numerous small grooves, for the lodgment of the superior maxillary nerve and its branches; and in its floor are sometimes found several conical processes, corresponding to the roots of the molar teeth, which occasionally penetrate this cavity. This bone has four faces or sides; the external or facial, which is the

anterior part of the bone, the interior or nasal, the superior or orbital, and the posterior or zygomatic.

FIG. 1.

FIG. 1. *a*, The body of the left superior maxilla; *b*, Canine fossa; *c*, Infra-orbital foramen; *d*, Incisive fossa; *e*, Harmonial suture of the two bones; *f*, Nasal spine; *g*, Semilunar notch of anterior nares; *h*, Nasal process; *i*, Articulation with lachrymal bone; *j*, Malar process; *k*, Tuberosity of superior maxilla; *l*, Cavity of the antrum; *m*, Lachrymal tubercle; *n*, Orbital process.

Near the centre of the irregular concave facial surface is a deep depression, called the *canine* fossa, which gives attachment to certain muscles of the mouth and nose, and immediately above this fossa is the infraorbital foramen, which transmits what remains of the superior maxillary nerve, after having supplied branches to all the teeth—a branch to each root—in the upper jaw. There are other fossæ or corrugations of this face of the bone, which give at-

tachment to other muscles; but, as they are not important to our present purpose, we shall not describe them.

The nasal surface forms a portion of the opening of the nose, and articulates with the lachrymal, ethmoid, and palate bones.

The superior or orbital surface is thin and triangular, and forms the floor of the orbit and roof of the antrum maxillare.

The posterior or zygomatic surface is bounded anteriorly by the malar process, and interiorly by a rough rounded border, called the tuberosity, which is pierced by several small foramina, which give passage to the posterior dental nerves and the superior dental artery. The lower part of this tuberosity articulates by a rough rounded surface with the palate bone.

The four processes of this bone, as already named, are the nasal, malar, palate, and alveolar.

The nasal process forms the lateral boundary of the nose, and articulates with the nasal and frontal bones.

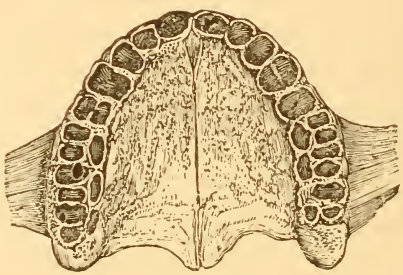
The malar process is large and irregular, and is at the angle of separation between the facial and zygomatic surfaces, and articulates, by a large triangular surface, with the malar bone.

The palate process projects horizontally inward

from the inner surface of the body of the bone. It is thick and strong, and is concave, both above and below, and forms the floor of the nares and a part of the roof of the palate.

The alveolar process forms the lower margin of the bone. Its exterior is dense and firm, its interior cellular. It contains in its whole length, a series of cells or cavities, into which the teeth are articulated, corresponding in number, size, form, and depth, to the number, size, form and length of the roots of the teeth in the jaw.

Fig. 2.



This process is much thicker where it arises from the body of the bone than at its free margins, at the necks of the teeth. Here it is thin; sometimes very thin and sharp. The septa between the cells, containing the roots of individual teeth, and between the different teeth, are thicker or thinner according

as the roots are divergent or close, or as the teeth are near or far apart.

In the bottom of each of these alveolar cells is a small perforation, or foramen, for the transmission of a nerve and artery to, and returning vein from, the root of a tooth contained in it.

The lower jaw is the largest bone of the face; and although it consists of two distinct symmetrical halves in the fœtus, is but one bone in the adult, united by a ridge at the centre, or that part which forms the chin, which is called the symphysis. It is of a semicircular, or more nearly, of a horseshoe shape; extends from the chin to the base of the skull, where it articulates with the glenoid fossæ of the temporal bone. It gives form to the lower part of the face. It is divided into a body and rami. The body is the horizontal portion, and on both its external and internal surfaces are various protuberances or processes, and indentations or fossæ, which afford attachments to the muscles of the lips and tongue; but as, in extracting the teeth, we have but little to do with any muscles except those which close the jaws, we shall not stop now to describe them.

About the middle of the bone, and just below the roots of the canine teeth, are the mental—sometimes called the *anterior* mental—foramina, which afford exit to the inferior dental nerve and artery, after

each having supplied a branch to each root of a tooth contained in the jaw. The upper edge of the jaw is

FIG. 3.

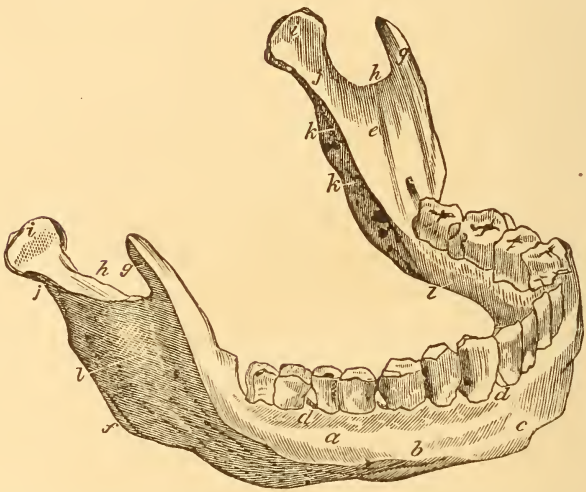


FIG. 3. The inferior maxilla; *a*, Body of the bone; *b*, Mental foramen; *c*, The symphysis; *d d*, Alveolar processes; *e*, Ramus of the lower jaw; *f*, Its angle; *g g*, Coronoid processes; *h h*, Sigmoid notch; *i i*, Condyloid processes; *j j*, Neck of the condyles; *k*, Inferior dental foramen; *l*, Mylo-hyoid ridge.

surmounted by the alveolar processes and cells, corresponding, like those in the upper jaw, in number, size, form, and depth, to the number, size, form and length of the roots of the teeth which they contain and support. These processes are wanting, mostly, in fœtal life and early infancy; and in old age, or at

an earlier period, with the loss of the teeth, are gradually wasted or absorbed away; coming with the teeth and departing with them.

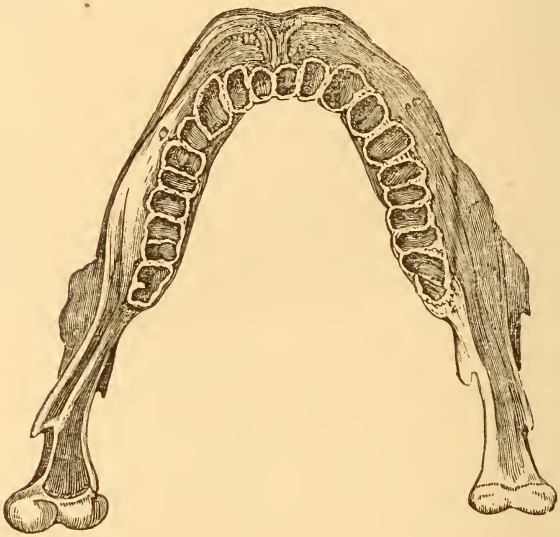
Fig. 4.

The anterior alveolar processes are thinner and higher than the posterior; the roots of the wisdom teeth being almost entirely imbedded in the body of the bone, or having at most a very short and thick process; a circumstance of great practical importance, as we shall see, when treating of the extraction of the lower wisdom teeth.

The ramus of the jaw is a strong, oblong-shaped process, rising from the posterior portion of each side of the body, forming an angle more or less obtuse, according to the age of the individual; in fœtal and infantile life being very obtuse, or almost horizontal with the body of the bone. In youth, and

till mature manhood, it slowly advances toward a perpendicular position, or right angle. After the

Fig. 5.



loss of the teeth, in old age, it is said again to decline. The upper portion of the ramus is divided into two processes, by a broad fissure, called the sigmoid notch. (See Fig. 3.)

These processes are called the coronoid process, and the condyle of the lower jaw. The anterior, or coronoid process, is broad at its base, rather thin, of a triangular shape, and affords attachment to the tem-

poral muscle. The posterior, or condyle of the jaw, is flattened from before backward, and is smooth on its top to form its hinge-like articulation.

Near the centre of the internal surface of the ramus is the inferior dental foramen, through which the inferior dental artery and nerve enter the jaw, and are transmitted through the body of the bone below the alveolar cells (each of which, like those in the upper jaw, is perforated by a minute foramen, for the transmission of a branch of each to its contained root of a tooth, and for the egress of the recurrent vein) to the mental foramen, where they pass out to be distributed on the chin. The posterior junction of the ramus with the body of the bone forms a rough tuberosity, called the angle of the jaw.

Sec. 2. The muscles that are chiefly concerned in the extraction of the teeth, and more particularly in the accidents that may sometimes occur in connection with that operation, and therefore require our present attention, are the temporal, the masseter, and the external and internal pterygoid. These are the elevators of the lower jaw, and also give it its forward, backward, and lateral motions.

The upper jaw has no independent motion. It only moves with the motions of the whole head.

The masseter is a short, thick, quadrilateral-shaped muscle. It arises from the tuberosity of the superior

FIG. 6.

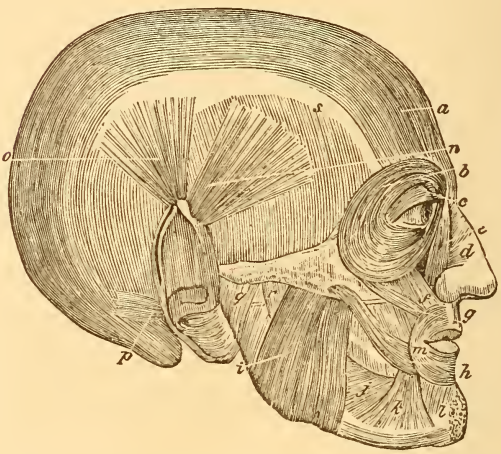


FIG. 6. *g*, Zygomaticus minor; *h*, Zygomaticus major; *i*, Masseter muscle; *r*, Deep-seated portion of masseter.

maxillary bone, the lower margin of the malar bone, and from the zygoma, and is inserted into the ramus and angle of the lower jaw.

The temporal is a broad, radiating muscle, occupying a large part of the side of the head. It arises from the whole length of the temporal ridge, from the temporal fascia, and from the entire surface of the temporal fossa. Its fibres converge to a narrow,

but strong tendon, which is inserted into the apex of the coronoid process, and from some distance down its inner surface.

Fig. 7.

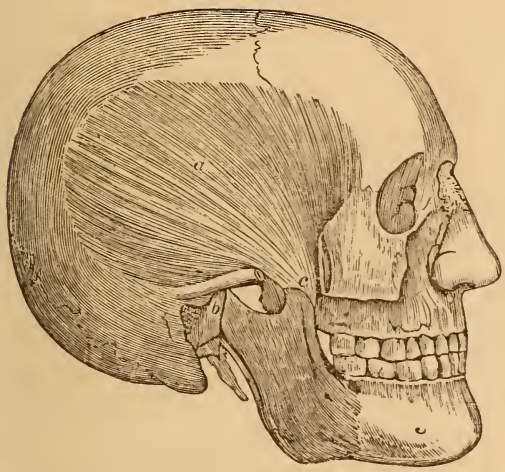


Fig. 7. *a*, Side view of the temporal muscle, exposed by the removal of the temporal fascia; *b*, External lateral ligament of the lower jaw; *c*, Insertion of temporal muscle into coronoid process of lower jaw.

The internal pterygoid (Fig. 8) is a thick quadrangular muscle. It arises from the pterygoid fossa, and descending obliquely backward, is inserted into the ramus and angle of the lower jaw. From its resemblance to the masseter, in appearance and direction, it has sometimes been called the internal masseter.

The external pterygoid is a short, thick, triangular muscle, being broader at its origin than at its insertion. (*a*, *b*, Fig. 8.) It arises from the pterygoid

Fig. 8.

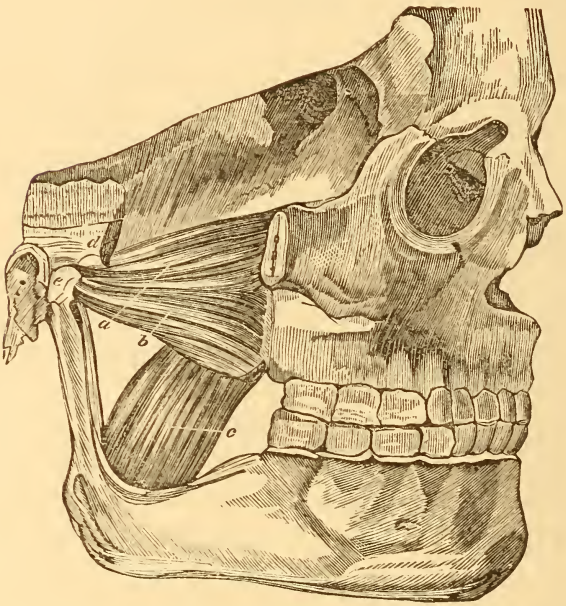


Fig. 8. *a* and *b*, Superior and inferior portions of the pterygoideus externus; *c*, Pterygoideus internus; *d*, Root of zygomatic process; *e*, Condyle.

The ramus is cut away, to show the internal pterygoid muscle.

process, pterygoid plate, and the tuberosity of the palate bone. It passes backward, and is inserted

into the neck of the lower jaw and its capsular ligament.

The office of the pterygoid muscles, when acting separately, is to give the lateral, or grinding, motion to the jaw. When acting together, they thrust the jaw forward, and close the mouth.

Sec. 3. *Anatomy of the Teeth.*—Man, in common with most other animals, is supplied with two complete and distinct sets of teeth,—a temporary and a permanent set.

In mankind, the temporary set, called also deciduous or milk teeth, consists of twenty teeth, ten in each jaw. They are of the sizes, forms and structure suited to the size of the jaws, and to the necessities of infancy and childhood. When by the absorption of their roots they are loosened and drop out, or are removed, their places are supplied by another, a larger and a stronger set, suited to the increased size of the jaws and to the wants of mature life.

The temporary set is divided into three classes: incisors, of which there are four in each jaw; canine teeth, or cuspidati, two in each jaw; and molars, or grinding teeth, four in each jaw.

The roots of the temporary molars are generally broader and thinner, and more divergent, according

to their size, than the corresponding permanent ones; and as this is the only material difference between them, or any other of the corresponding classes of the two sets, except the much smaller size of the temporary, a particular description of their forms is here unnecessary.

The permanent set consists of thirty-two teeth, sixteen in each jaw. They are divided into four classes, each having very distinct and definite forms; to wit: four incisors, two canine or cuspidati, four bicuspidati or small molars, and six molars, in each jaw. The incisors, for convenience of description, are, from their positions, subdivided into right and left, central and lateral incisors. The bicuspidati, into first and second, or anterior and posterior, right and left; and the molars, into first, second, and third, right and left molars; always reckoning from the front backward. The third molars are also called dentes sapientiæ or wisdom teeth, from their coming later in life. They vary greatly in the time of their coming; sometimes appearing as early as sixteen years of age, and sometimes not before thirty-five.

The length, width and thickness of all the teeth, and the curvatures of the crowns of the incisors, vary materially in different individuals, according to the configurations of the persons to whom they belong. Thus, tall, slender persons, usually have com-

paratively long and narrow teeth, while short, thick-set persons have shorter, broader, and thicker teeth. Short thick-set persons too, usually have thicker bones and alveolar processes than those with more slender forms. Their teeth are generally more fimly set, and therefore, require more force to effect their removal.

The color of the teeth varies too, in different individuals, from an almost pearly white, to a deep tinge of yellow, brown, or blue, closely corresponding with the complexion of the individual. Their color also varies with the age of the individual, from light in youth, to dark in age.

Their density, strength and durability are also quite variable, cachectic and lymphatic persons mostly having thin, soft, frail teeth, while the robust and healthy have thicker, denser, stronger, and more durable ones. Their density varies, too, with the age of the person, being much more solid in age than in youth.

Each tooth, for convenience of description, is divided into three parts: the crown, the neck, and the root or roots. The crown extends from the edge of the cutting, or the grinding surface, as the case may be, to the gum; or is that part which is exposed to view, and is covered by the enamel.

The neck is the slightly constricted portion next

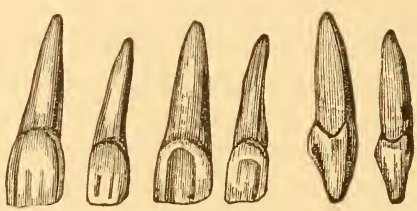
to the crown, and extends, when the parts are in a normal condition, from the edge of the gum to the edge of the alveolus, or perhaps more strictly, from the crown to the bifurcation in the molar teeth.

The root, is that part of the tooth contained within the alveolar cell or socket, and articulates it with the jaw.

Although the crowns of the same class of teeth vary very much in form and size, in different individuals, a general outline of the description of any tooth belonging to a given class will be the same.

The superior central incisors occupy the anterior central portion of the upper jaw; one on each side of the mesial line of the face. Their crowns are of an oblong, quadrilateral form, averaging about five

FIG. 9.



lines in length by four in width; and usually a little wider at their free, or cutting edges, than at the gum, or necks of the teeth. Their cutting edges are nearly straight across, though their corners, and especially

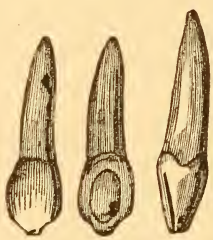
their outer ones, are sometimes slightly rounded. Their anterior, or labial surfaces, are always more or less convex, while their inner or posterior surfaces are correspondingly concave; the interior surface forming the segment of a smaller circle than the outer.

The tooth is much thicker at the gum than at its edge, and presents an appearance as if it had been formed into a wedge, by cutting away the inner surface of the tooth, and then slightly bending it inward, with a regular curve from the neck to the edge. The roots of these teeth average about seven lines in length, and about three lines in diameter. They are irregularly conical in shape, tapering, somewhat unevenly, to their points; and the outer portion forming the segment of a rather larger circle than the inner.

The lateral incisors are next in order to the centrals. Their crowns are usually a little shorter than those of the centrals, in the same mouth, and about three-fourths their width. Their corners are more rounded than those of the centrals, and especially their outer corners, which are generally considerably so. Their roots, though slightly shorter, are very nearly of the same length as the others, but are generally considerably more flattened, or compressed, laterally, than they. The outer portion, like the centrals, is larger than the inner.

Next to the lateral incisors are the cuspidati or canine teeth; one on each side. The crowns of these are about the same length and width as the central incisors; but they are thicker at their necks, from their outer to their inner surfaces, and stronger than the incisors, and instead of being like them broad and straight across their edges, they are tapered for about half their length to a blunt spearlike-shaped point. They are also more convex on their labial surfaces, and but slightly, if at all, concave on their internal or lingual surfaces. From their greater thickness they stand a little more prominent than

Fig. 10.



the other teeth, forming approximations to *corners* in the dental arch. Their roots are both larger and longer than those of any of the other teeth, being most commonly a line or more longer than those of the central incisors. Their roots are also shaped differently from those of any of the other teeth, for they

are not only larger at their neck, but they taper to more slender points. They are, though sometimes almost perfectly round, usually about once and a half as large in their antero-posterior diameter as in their approximal, with the appearance of having been compressed or flattened like the roots of the upper lateral and all the lower incisors. A transverse section of the root presents an ovoid form, though the outer or larger portion of the root would generally be a little larger, and the smaller or inner portion a little smaller in proportion, than a longitudinal section of an egg. The roots of these teeth are more frequently curved, in part, or all of their length, and more subject to have short crooks in them, and are generally more closely and firmly articulated with the alveolus, and therefore require more force for their removal, than any other of the single-rooted teeth.

All the incisors and cuspidati of both jaws, the second or posterior bicuspidati of the upper jaw, and all of the bicuspidati in the lower jaw, have each uniformly but one root.*

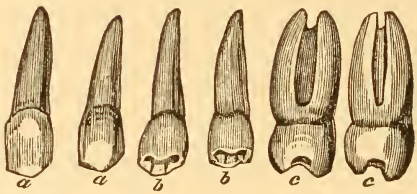
The upper bicuspidati come next in order.

Their crowns are a little shorter than the preced-

* Since writing the above, Dr. Randall, of Farmington, President of the Maine Dental Society, has shown me a pair of upper bicuspidati, extracted by him, having two well-defined roots each,—the bifurcation extending to their necks.

ing, and are very nearly an ovoid shape, but somewhat compressed on their approximal sides,—the

Fig. 11.



larger end representing the grinding surface of the tooth, which is furrowed in the direction of the arch of the teeth by a broad triangular groove, thus leaving two—an outer and an inner—rather blunt tubercles or cusps, and the smaller end of the egg truncated to represent its union with the neck of the tooth.

The first or anterior bicuspidatus on each side, most commonly, but not uniformly, has two roots,

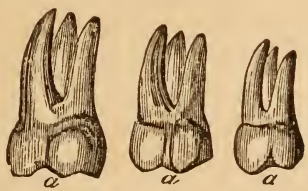
Fig. 12.

an external and an internal. They are small and round; sometimes regularly and increasingly divergent from their bifurcation to their points. Sometimes they are considerably divergent for a half or

two-thirds of their length, and then convergent till their points nearly, or even quite, come in contact with each other. Sometimes they take a course quite close and parallel to each other, as if they had been originally but one flattened root, simply split in two. At other times they are found having but one root, very much flattened on its approximal sides, and grooved so as to show the rudiments of two roots.

The second or posterior bicuspidati, as already remarked, have uniformly but one root each, which is always compressed or flattened and grooved on its approximal sides. Their crowns are entirely similar to those of the anterior. The roots of all the bicuspidati are of about the same length as are those of the incisors.

Fig. 13.



The upper molar teeth, three on each side, are the last in the order, and the largest of them all. Of these, the first or anterior is a little the largest, and the third or wisdom tooth is considerably the smallest.

The crowns of these teeth are nearly cubical in shape, with their corners all rounded. In size each of their surfaces or faces is about equal to or a little larger than the face of the central incisor belonging to the same set. Their grinding surfaces are of course broad, and they are furrowed or cut by several triangular grooves leaving at least four or more tubercles or cusps.

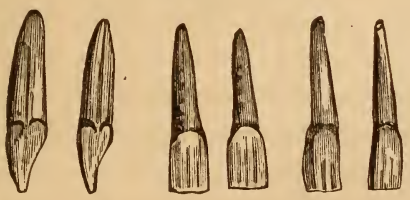
They have ordinarily each three roots. Two external or buccal, and one internal or palatal. The external roots are an anterior and a posterior. Of these two, the anterior is larger than the posterior, being indeed about twice its size; it is broad and flat, being compressed from before backward, and stands out more prominently in the arch than its fellow. The two stand nearly perpendicular to the outside of the crown, but usually diverge more or less from each other. The internal root is generally the longest of the three. Its size is about the same as that of the anterior external root, but instead of being flattened like that, it is round or nearly so. It generally diverges considerably from the perpendicular of the crown toward the palate, but after diverging for about two-thirds of its length, the remaining portion most commonly converges toward the points of the other roots. Sometimes, and indeed not unfrequently, this and one of the other roots are united

for nearly or quite their entire length into one broad flat root. This union is much more frequent with the anterior than with the posterior root. Sometimes, too, all three of these roots are combined into one large irregular root, which is simply grooved so as to show the rudiments of the three roots. This is much the most common, indeed, quite common, in relation to the third molar or wisdom teeth.

The upper wisdom teeth too are perhaps more frequently found irregular in relation to the line of the arch of the jaw than any other class.

When malposition of these occur, they are generally found with their multi-cuspidated or grinding surfaces looking toward the cheek. So circumstanced the roots of teeth are usually more or less hook-shaped, as if the crown of the tooth had been seized while standing in its proper position and forcibly bent outward.

Fig. 14.

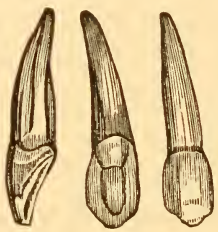


The crowns of the lower incisors are of about the same length as are those of the upper, but much

narrower, these being but about two and a half lines in width. They are a little broader at their cutting edges than at their necks. The centrals are usually a very little narrower than the laterals, while in the upper jaw the reverse of this always obtains: the centrals there being much broader than the laterals. The roots of the centrals are a little shorter than their laterals. The roots of all the lower incisors are very much compressed or flattened on their approximal sides. They are very nearly of the same length as those of the corresponding teeth of the upper jaw.

The lower canine teeth, or cuspidati, are shaped

Fig. 15.



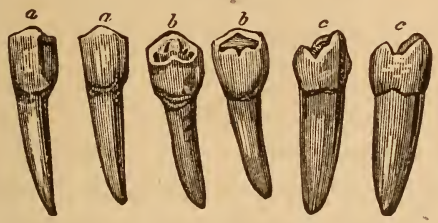
very similarly to the upper, except that they are smaller and rather more pointed, and their roots are more compressed or flattened.

The crowns of the lower bicuspidati are of about the same length, but a little more slender than the upper. In form, otherwise, they are very nearly

the same as those, except that the inner cusp of these is usually smaller, especially that of the first or anterior one, which frequently presents only the rudiment of an inner cusp.

The inner cusps of both the upper and lower bicuspidati are always smaller than the outer.

Fig. 16.



The roots of these teeth are also a little more compressed, and a little smaller than those of the corresponding upper ones. But as has already been remarked, these teeth have invariably but one root each.

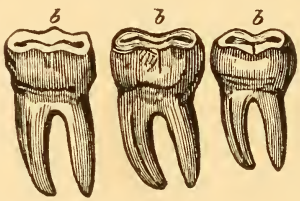
The crowns of the lower molars so nearly resemble the upper, they require no separate description.

They have each usually two roots: an anterior and a posterior. They are broad and flat, and thinner in their central portions than at their edges.

The anterior root is generally a little larger and a little longer than the posterior. They bifurcate just at the edge of the alveolar process; and at that

point usually diverge more or less extensively to their extremities; though they sometimes diverge only for a portion of their length and then converge till their points nearly or quite meet; thus inclosing

Fig. 17.



that part of the alveolus which forms the septum between their sockets, which must be brought away on removing the tooth—a circumstance that often greatly complicates the operation of extraction, and always renders much more force necessary for that operation. Sometimes they diverge but little—the roots being parallel to each other and in almost complete apposition. Occasionally, too, each of these roots are divided in their centres, for a part or all of their length, making four distinct roots. This, however, is of no practical importance, in so far, at least, as the operation for their removal is concerned. The lower wisdom teeth are more frequently irregular in the number of their roots than any others.

The lower wisdom teeth have also another peculi-

arity, which to some extent, at least so far as my observation has extended, is unvarying, and which is of very great practical importance, as it renders an entirely different mode of procedure and different instruments necessary for their ready removal;

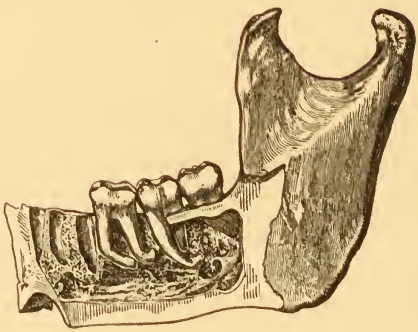
Fig. 18.

which I shall discuss more fully when treating of the extraction of this class of teeth, which in a description of the anatomy of the teeth must not be omitted. This peculiarity consists in the fact that the roots of these teeth are always more or less curved, sometimes almost hook-shaped, and the points of their roots or foramina—the point of every root of every tooth is pierced by a minute foramen, which affords passage for a branch of nerve and artery which supply nutriment and vitality to its crown—pointing or looking toward the angle of the jaw.

Sometimes the roots of any or all of the lower molar teeth—and sometimes too, but more rarely, those of the upper molars—are found terminating in small hooks, as seen in the cut.

The roots of the wisdom teeth are shorter than those of any other class.

Fig. 19.



The teeth are held in the jaws by a kind of articulation peculiar to themselves, called a gomphosis articulation, or like that of a nail driven into a board or other substance. So it is denominated, and described, by anatomists; but in other words, and more exactly and more plainly, each root of every tooth has a cell in the alveolar process, corresponding in depth and form to its form and length. These cells, or sockets, are enough larger than the contained roots of the teeth, to admit of their being lined by a dense, strong membrane, called the periosteum; which is also reflected upon the root. This, with their roughness, their crooks, and their irregularity of form, and

their divergencies and their convergencies, holds them very firmly in their places ; so that, when they are healthy and intact in all their parts, it requires a considerable force to remove or displace them.

CHAPTER III.

PATHOLOGY OF TOOTHACHE.

SEC. 1. TOOTHACHE proper—(there is scarcely more propriety in calling all painful affections of the teeth, toothache, than there would be in calling all pains in the head, headache)—is usually the result of either caries of the teeth, or of the absorption of the gums and alveolar processes, or of mechanical causes or violence.

Caries of the teeth is the effect of various causes: such as, deleterious substances coming in contact with, and acting chemically upon them; hereditary malformations and imperfections in their organization and structure; and from insufficient supply of the proper materials of which they are composed, occasioned by want of proper aliments, or an inability to assimilate them, by reason of sickness or other causes, while the teeth are in the process of formation within the gums and alveolar processes. Mechanical violence, too, may be an indirect cause of caries of the teeth.

The agents that act chemically upon the teeth to produce caries, are acids. Many other substances may indirectly produce this effect, by deranging the general health, and thus changing some of the secretions, which in a normal state are either neutral or alkaline, to an acid reaction. This altered secretion coming in contact with the teeth decomposes and destroys them. Still the direct agent is an acid. All acids act upon the teeth, when in contact with them, with more or less vigor, according to their kind and strength; hence persons addicted to eating lemons, or other strongly acid fruits, are very liable to suffer from caries of the teeth.

Dyspeptics, who are troubled with great acidity of the stomach, and with frequent regurgitations of such fluid into the mouth, as is a very common occurrence in such cases, are almost always sufferers from this cause. Persons taking acids as medicines, without taking proper care to avoid their coming in contact with their teeth, or immediately to neutralize the acid, suffer in the same manner.

The saliva in its normal state, including the saliva proper and the buccal mucus, is alkaline. The mucus is slightly acid, while the secretion of the glands—which is by far the most abundant secretion—is alkaline. One effect of a very large share, if not of most of the diseases to which humanity is subject, is to

change the saliva from an alkaline to an acid reaction. Thus, during sicknesses of various kinds, the teeth are constantly bathed in acid, and therefore suffer greatly.

As medicines are usually administered during sickness, and as the teeth are almost uniformly observed to suffer at such times, the almost universal impression is, that all medicines injure the teeth; whereas all medicines, so exhibited as to restore health—to restore the secretions, and especially of the mouth, from an unhealthy to a healthy condition, from an acid to an alkaline reaction, protect the teeth from decay, instead of injuring them.

Even the stronger mineral acids, when so carelessly administered as to be allowed to come in contact with the teeth, and no care taken to neutralize them, though for the time they may severely injure the teeth, if they be not too long continued and if their effect be to restore the health, may even afford more protection than injury to them. But as such medicines, used without due care, greatly injure the teeth, great care should be taken to avoid their coming in contact with them, or they should be followed by such alkaline or antacid washes as will neutralize their effects. And in the topical use of some of the salts having acid bases, as nitrate of silver, by the greater affinity of its nitric acid for the lime of the tooth than for the silver, if allowed to come and to

remain in contact with the teeth, will have the same decidedly injurious effects; it should therefore be administered with the same caution.

So too, whenever the physician is called to the treatment of any case where the saliva is changed to an acid reaction, if he would do his patient all the good he can, he should prescribe antacid washes to be frequently used with a view to the protection of the teeth, and care should be used, too, to see that this condition of the secretions is not overlooked.

Imperfect organization of the teeth, from whatever cause, subjects them to great liability to decay; for two reasons. First, such teeth are less capable of resisting the action of deleterious substances that may come in contact with them; and secondly, and most especially, the enamel of such teeth does not perfectly cover and protect their dentine. They have imperfections or interstices, at the lines of union of the different parts of the enamel, where they approximate and should unite, from the different points of deposit, affording ready lodgment for any free acids that may chance to be in the mouth, as well as for food to be forced into, by mastication, there to lie and ferment and become acid.

Mechanical violence, as accidental fracture; or chipping off small fragments of enamel, by biting very hard substances, as cracking nuts, and the like;

the use of the file, &c., has the same effect. They all remove more or less of the enamel, and also leave the surface roughened, so as to afford lodgment for foreign substances, and render them difficult to be kept clean.

The habit of placing artificial teeth in the mouth, and sustaining them there by clasps, or bands, around other teeth, is also another great source of the decay of these organs; and the broader these clasps are, and the more perfectly they are fitted to the teeth which they embrace, the more destructive they are; for so much the greater and more perfect a lodgment do they afford for such foreign substances, and the more perfectly do they keep them in contact with the teeth. The bad effects, in these cases, are mostly chemical, and not mechanical. The use of clasps, therefore, is but rarely justifiable, and, fortunately, but very seldom necessary.

Although caries is by far the most common cause of toothache, there are many other causes that produce it, and caries itself produces several varieties of this most painful disorder. This, therefore, brings us to speak more particularly of the different

Sec. 2. *Varieties of toothache and their causes.*—For convenience and clearness of description, toothache may be divided into

1. Toothache from exposure of the nerve (I use the word nerve in its common acceptation, implying by it the whole soft internal part of the tooth; including nerve, artery, vein, and cellular substance, or as it is, by dentists, most commonly called the pulp of the tooth).

2. From inflammation of the nerve without its direct exposure, resulting in the formation of pus in the dental canal, abscess, &c.

3. From inflammation of its periosteum.

4. From inflammation of its dentine.

5. From sympathy or reflex irritation—neuralgic toothache.

6. From exostosis.

7. From accidents.

1. *Toothache from exposure of the nerve* is probably the most common of all the varieties. This may be produced by the accidental fracture of the tooth, but is most commonly produced by caries.

Caries may attack a tooth in any part of its exposed, or external surface; but it does so most frequently, at the bottom of the grooves of the grinding surfaces of the molars, in the interstices left by a defective union of the enamel there; in the approximal surfaces of any or all of the teeth; in the exterior or labial surfaces of the incisors, and of the cuspidati

(and when in this surface most commonly just at the edge of the gum), and often, but less frequently, on the buccal surfaces of the bicuspidati and molar teeth, and on the lingual surfaces of the incisors and cuspidati.

Toothache from exposure of the nerve generally occurs, except when caused by accident, where caries has progressed until but a very thin covering of dentine remains over the nerve, or if the caries have commenced, and has progressed with but a very small orifice through the enamel, until it has quite reached the nerve, undermining the enamel as it progresses, and, as often happens without causing pain, when by picking the teeth or masticating food, or by biting some hard substance, this thin shell of enamel, or of dentine, as the case may be, is broken in, and the toothpick, or the fragment of the tooth, or portion of the food, is forced upon the nerve, producing a sudden attack of the most excruciating pain. This may be alleviated or entirely relieved, for the time, by the removal of the foreign substance, and the application of any of the stronger stimulants, as creasote, the essential oils, or chloroform; but the pain will be liable to return whenever food, hot or cold fluids, cold air or other foreign substances, are suffered to come in contact with the nerve. In this state they sometimes remain for weeks, or even

months, without giving much if any pain except from such extraneous causes; when at length, from frequent irritations of this kind, inflammation will be induced, when a more continued, but still severe, pain will be likely to ensue. If left to its natural course, suppuration soon occurs and the nerve is thus destroyed, when, in many cases, all pain will cease and not again occur till the whole crown and even a large share of the root is wasted by decay. But this is by no means the uniform result; for sometimes the inflammation of the nerve extends through the foramen to the periosteum. This occurs much most frequently in the lower jaw, where pus formed in the canal, or food, or the fluids of the mouth may be carried through the foramen by the force of gravitation, and thus produce inflammation about the point of the root. When this state occurs, a less acute but a more steady and annoying character of pain ensues, and which is liable to be more acute at night while warm in bed, and in a horizontal position, than while up during the day. This may be accounted for by the warmth and the horizontal position favoring a greater determination of blood to the part than an erect position. Occasionally too, from some remaining portion of the membranes, a troublesome, painful, fetid fungus will arise, sometimes filling the whole nerve-canal as well as the cavity caused by the decay, which

will require the removal of the tooth. This kind of fungous growth may generally very readily be distinguished from an exposed nerve by its bright or red color, by its being far less sensitive, and by its free bleeding on being very slightly touched. Such bleeding will very much reduce the size of the tumor, and frequently entirely relieve the pain; which may not again recur until the tumor is again formed and filled with blood, which however will most likely occur in a few days.

In almost all cases of toothache from exposure of the nerve in the upper incisors and cuspidati, if the caries has not already so far destroyed the crowns of the teeth as to render the operation of filling impracticable, a radical cure can be effected by early and efficient treatment; and very many of these teeth can be restored to usefulness and health, by suitable treatment, even after they have been long neglected, and abscesses have been formed; but such delay greatly complicates the difficulties and lessens the chances of restoration. A majority of the upper bicuspidati, many of the upper molars, and some of the lower teeth, may thus be saved. The success of the treatment, especially in the molars, will very much depend on the convenience, or the possibility, of getting at the part decayed, and through that to the nerve-canals; without this possibility, all at-

tempts at treatment must at best be very uncertain and most probably futile.

In order to treat such teeth successfully, the exposed nerves should be removed, either directly by the use of suitable instruments, or, where this is not practicable, by the use of caustics; of which arsenious acid, moistened with creasote, is the most effectual and quickest in action; from the twentieth to the sixteenth of a grain, or less, of which, applied on a very small pledget of lint or cotton, and left in contact, from six to twenty-four hours, being entirely sufficient, in most cases, to effect the object. Great care, however, should be taken in the use of arsenic for this purpose, to avoid letting it come in contact with the gums and other parts of the mouth, lest ulceration and sloughing be produced. Some very serious accidents have occurred from the incautious use of this article.

After the nerve has been thus destroyed, the nerve-canals and the cavity of decay should be thoroughly cleansed from all diseased dentine, pus, and foreign substances; or if the nerve has been destroyed, in the natural course of events, by suppuration, all such matters, and everything that might decompose and form either pus or gas, should be carefully cleansed away, and, if necessary, otherwise properly treated, and the roots and cavities carefully filled.

The treatment of the upper teeth with a view to their preservation by destroying their nerves, is much more likely to be successful than of the lower, as the force of gravitation is liable to bring the articles used for the destruction of the nerves, as well as particles of food and the fluids of the mouth, during the time of the treatment, in contact with the periosteum at the point of the root, thus exciting a troublesome and sometimes an uncontrollable inflammation in that membrane.

2. *Toothache from inflammation of the nerve without direct exposure.*—This occurs when, from caries, the absorption of the gums and alveolar processes, attrition, or other causes, the nerve of the tooth has so far been deprived of its natural protection, that the passage over it of hot or cold fluids, or the contact of cold air, produces irritation of this delicate and extremely sensitive structure. A tooth may, and frequently does remain in this situation for a considerable length of time without being much, if any, troublesome, except while the cause of the irritation remains, as while taking a draught of cold water, a cup of hot coffee, or the like; but at length, after repeated irritations of this kind, inflammation supervenes, and then the real trouble commences.

When active inflammation exists in the nerve of

a tooth so circumstanced, a steady severe pain is experienced; and its intensity is owing, greatly, to the fact that inflammation in the soft parts always produces swelling, and as the nerve—the pulp of the tooth—is confined in an unyielding canal of bone, it is subjected, by this swelling, to a severe pressure; its only means of expansion or escape being through the minute foramen in the point of the root, which till suppuration has taken place is of no practical effect, as it is altogether too small to admit of integument or membranes being forced through it.

Usually, within twenty-four hours of the commencement of severe pain, the tooth begins to feel sore, and a little longer than the rest, and perhaps a little loose. Sometimes the tooth is so sore, from the inflammation of the membrane about the point of its root, that but a slight touch upon it, with the finger, will make the patient start suddenly, or even cry out with the pain.

At this stage, suppuration has commenced, and the pus is beginning to be forced through the foramen of the root. The pressure of this matter produces inflammation and swelling of the membranes at the bottom of its alveolar socket, and this raises the tooth slightly in its socket and accounts for its extreme sensitiveness to the touch; and particularly,

by its contact with its fellow opposite, on closing the mouth.

If the case be not now relieved, the pus, by the pressure within, is forced through the foramen, and insinuated between the point of the root and its periosteum, forming a sac larger or smaller, from the size of a pin's head to that of a pea. During this stage the pain may dart along the course of the nerves, to any or all of the teeth on that side of the head, to the temple, the ear, or the scalp; or to any part where the branches of the fifth pair of nerves are distributed; that being the nerve which supplies the teeth with branches. The pus still being confined in a bony cell—the alveolar cell—the pressure is great and the pain severe. But soon, the pus forces its way through the parietes of the alveolus. Then the face begins to swell, and the pain is less severe and of a different character—being of that throbbing character which indicates the formation of abscess, accompanied often with considerable febrile excitement.

If the difficulty be not arrested here, abscess will pretty certainly follow. These abscesses usually "point" on the gum, but sometimes, and not very unfrequently, unless prevented by making a free incision through the gum, if the tooth causing it be a molar of the lower jaw, on the cheek, leaving an un-

sightly scar; or if the tooth be in the front of the mouth, under the chin. Sometimes, too, if the tooth happen to be a first or second molar in the upper jaw, and if, as sometimes happens, the roots of the tooth enter into, or come very near entering into, the antrum maxillare, the abscess will be developed in that sinus.

This train of symptoms and consequences is sometimes produced by the injudicious or careless insertion of plugs or fillings in the teeth, or a like insertion of an artificial tooth, by pivot, on a natural root.

The proper treatment for this kind of toothache, as will readily be seen by this description, is either to expose and destroy the nerve before suppuration has commenced, or to give vent to the pus as soon as it is formed. This last can readily be done by the use of a very small drill, or trocar, inserted into the cavity caused by the caries, at the point nearest to the nerve-canal, or if the trouble be the result of some other cause than caries, by trepanning the root at any accessible point, thus making an opening for the escape of the pus; and if this be done before the formation of the sac, and the tooth is such a one and so situated as to admit of having the canal or canals of its root or roots thoroughly cleansed and filled in the manner already described for that operation, not only permanent relief, but the future use-

fulness of the tooth will be secured. But after abscess is once formed, the case becomes much more complicated and uncertain as to the results of treatment. Still, by judicious and persevering treatment, many cases can be cured, and others may be rendered useful and quite tolerable for years, even after this state has occurred. I have seen cases where a fistulous discharge had been kept up through the gum, from an old abscess, for several years, even at that late day entirely restored to health. But in relation to the success of treatment much will depend on the situation of the teeth, with reference to the facility of getting at them, and also to the extent of the mischief caused by the abscess. If it has caused much necrosis or wasting of the alveolus, or if it has denuded the root to any considerable extent of its periosteum, treatment will be hopeless. For the root of a tooth that is denuded of that membrane, beyond a very small portion of its very apex, will lose its vitality and act as a foreign substance, keeping up a constant irritation and discharge of pus. And if the abscess have formed within the antrum maxillare, or if it have pointed on the outside of the cheek, or under the chin, the only prudent course left is to remove the tooth, and the sooner this is done the better.

Although trepanning a tooth may afford relief

from present pain and secure the future usefulness of the organ, if pus has formed in the nerve-canal, and enough has been forced out to form a sac on the end of the root, of the size of a pin's head, it can never return through the foramen, to be discharged through the tooth; but if the tooth is trepanned at this stage, so as to evacuate what is in the canal of the tooth, and thus relieve the pressure, that amount, or even much more than that, may be absorbed, and no abscess be developed; otherwise, that will sooner or later, and surely, be the result.

Although what I have already described, is the usual course of the progress and development of pus confined in the canal of a tooth, sometimes it takes quite a different course of progression, but finally terminating in the same result. Thus, the nerve becomes inflamed and suppurates, and a sac is formed of even the size of a small pea, and the face swells slightly, and so remains, for, it may be, some days; but at length the pain and the swelling subside, and entirely cease, while the sac, or rather the yielding and protrusion that it causes in the alveolus, can be distinctly felt with the finger through the gum, and by pressure upon it a sensation of fulness is apparently felt in the tooth, and so it may remain even for months without giving further trouble; but unless this sac be cut down upon through the gum and

alveolus, and the pus discharged, it will ultimately, from some exciting cause, as the taking of cold, or exposure to the excitement of unduly hot or cold fluids taken into the mouth, be incited to renewed action, burst, and abscess be fully developed.

Sometimes, but much more rarely, after the nerve of a tooth has been destroyed, either by operation or otherwise, the canal may become stopped with food or other substances, by mastication, so as to prevent the egress of pus through the crown of the tooth, and abscess be developed in the same manner as if the nerve had never been entirely exposed. Sometimes, too, even when pus has ceased to be secreted, gas may be formed, and by being thus pent up may be forced through the foramen so as to produce inflammation and terminate in the same result. These are the chief and almost only causes of alveolar abscess, though an accident, such as a severe blow on a tooth, is said sometimes to cause it, and undoubtedly may do so; but I have never yet seen one from this cause. Sometimes, but very rarely, an abscess may form from a dead root of a tooth, but generally such cases are simply the filling up of an old abscess which originated before the crown of the tooth was broken, of which the root remains and continues to act as an irritant. Generally when pus is formed around an old root of a tooth, it exudes between the root and

the alveolus without forming a distinct abscess. Abscess, caused by a tooth having been decayed or denuded of its natural covering, is always formed at the point of its root, or if not, I have never yet found the sac of an incipient abscess, nor the remnants of the sac of an old abscess, at any other point, or part, of a tooth. This I write after an experience of more than twenty years. In that time I have extracted many thousands of teeth; and in the very commencement of my professional career I had my attention especially directed to this particular branch of their pathology, and have, therefore, observed them carefully, and almost constantly ever since, in reference to this particular point.

Inflammation of the periosteum of a tooth, instead of being resolved by the formation of pus, sometimes, and indeed often causes a deposit of lymph. This may be deposited at the bifurcation, or at any other part of the root, and has been mistaken by some observers—I should rather say writers—for the remains of the sac of an abscess. The difference, however, may very easily be distinguished, from the patent fact, that wherever an abscess or sac containing pus has been formed, whether large or small, that part of the root under such sac, that is, the part where the pus lay, is always denuded of its investing membrane or periosteum; while, in the other case the

membrane remains firmly attached to the root and the lymph is adherent to it.

3. *Toothache from inflammation of the periosteum.*— This usually occurs in the periosteum of old roots of teeth whose crowns are gone; or in the periosteum of such teeth as have had their internal membrane destroyed by escharotics, whose effects have extended beyond the pulp to that membrane; or by the inflammation caused by the exposure of the nerve, by neglect of proper treatment, having extended to that membrane; or sometimes in sound teeth whose antagonists have been removed, thus leaving them without the necessary exercise to keep them in a healthy condition; and also by artificial teeth being attached to natural ones by clasps, the weight of the artificial ones dragging them from their sockets and loosening them.

This is the kind of toothache that has sometimes been thought to be "epidemic!" These "epidemics" occur after long rainstorms, or other great atmospheric changes, and as teeth in this condition are always liable to be affected by "taking cold," they are usually most troublesome after such changes; and as there are always a great many of them in every community, such epidemics are pretty frequent.

The pain, in this kind of toothache, is described as

of a more dull, heavy character, and the tooth though sore is not so extremely sensitive to the touch as that last described. This kind may readily be distinguished from the others by observing the condition of the gum, which presents a livid appearance along the course of the root, with more or less swelling; generally, however, with but little, showing a chronic state of inflammation. There may be a kind of puffiness opposite the point of the root, and perhaps a slight discharge of pus may ooze out by pressing slightly upon it with the finger. This is occasioned by the partial filling up of an old, and most likely fistulous abscess, which is a very common cause of this affection. There is but rarely any, or at most but little swelling of the face, accompanying this kind of toothache. The pain, though generally not very severe, is very annoying, constant, and troublesome. It may usually be palliated by local bleeding, by holding cold water in that part of the mouth, or by other antiphlogistic remedies; and if the pain be caused by the dragging of artificial teeth or the loss of the opposing teeth, a removal of the irritating cause and frequent friction of the gum with a brush, accompanied with some strongly astringent and stimulating wash, may effect a cure; but if the disease is connected with a dead tooth, or an old root, the only radical cure will be extraction.

4. *Toothache from inflammation of the dentine.*—This kind of toothache is produced by the use of the file, or other mechanical injuries, and by caries—and much the most frequently by the latter—and in most cases is most severe when the caries has extended only through the enamel, or but very slightly into the dentine; and for the probable reason, that here, that is, at the union of the enamel with the dentine, is the termination of the nerve-fibres that ramify the dentine; the greatest amount of sensibility always being found in any part, at the termination of the nerves. This kind of toothache is usually developed by the contact of cold air, acids, sweets, or hard substances, coming in contact with the inflamed dentine; and generally subsides when such irritant is removed, or ceases to act. The intensity and the persistency of pain from inflammation, other things being equal, depends chiefly on the degree of organization or vascularity and vitality of the part. Dentine, having but a low grade of these, is not susceptible of the same degree of inflammation as the soft parts, or even as other bones which are more highly organized.

Some teeth are much more highly organized than others: for example, persons of a strumous diathesis have softer and more highly organized teeth than those with better constitutions; and children and

youth, than those advanced in years; hence the teeth of the young and those with bad constitutions are much more liable to suffer from inflammation of the dentine than those who are older, and the healthy and strong.

I am fully aware, in the outset, that in calling this affection, *inflammation*, I am treading on controverted ground—that many contend that dentine is not susceptible of true inflammation. What then is the cause of this sensitiveness, and this pain? Will calling it "exalted sensibility," or some other name, change the facts or aid our understanding of them? It is true that parts that have no circulation can have no inflammation. Enamel is never inflamed—is rarely sensitive. It is also true that dentine cannot manifest all the characteristics of inflammation as manifested in the soft parts. From the density of its structure it is not susceptible of swelling. Neither are any of the common bones; but does anybody, on that account, deny their susceptibility to inflammation? From the small amount of the vital fluids circulated in the teeth, they are not susceptible of perceptible increase of heat. Is that condition perceptible in inflamed bone? Redness of the parts is another concomitant attending inflammation of the soft parts, which, usually cannot attend, or at least be appreciated in, inflammation of the dentine.

Red globules of blood do not permeate healthy dentine; and most writers have contended that they do not under any circumstances. This, my own observation has satisfied me, is not correct. Some highly organized teeth—though I admit the cases may be rare—may, and do, circulate red blood when in a state of inflammation.

In 1845, I was applied to by Miss N., a young lady of about eighteen years of age, of a spare habit and of a very marked cachectic diathesis, to fill several of her teeth. Each of her four upper incisors had rather a large cavity in its anterior or labial surface. In removing the decayed portions, preparatory to filling, I found the dentine extremely sensitive; so much so, that I was obliged to make some application to obtund it before I could complete the operation. But I finally succeeded in doing it, and, for the time, very satisfactorily. But in two or three days my patient returned complaining of great pain in her teeth, and contended that the pressure of the gold within the cavities caused the pain. On examination I found that the crown of each of them had a very decided tinge of red. Thinking it possible that I might, unwittingly, have exposed or wounded their pulps, and that the fillings were pressing upon them and causing the pain, and that possibly, too, blood was extravasated under the fillings,

thus causing the redness, I removed the fillings. This immediately gave her some relief—it removed the sensation of pressure that she had complained of, though it did not afford entire freedom from the pain.

After removing the fillings, I made a careful examination of the cavities, but could find neither extravasated blood, nor the least point of exposed membrane in any of them; but the dentine over the whole surface of the cavities was quite red and very sensitive—much redder, of course, than it appeared when seen through the enamel before the fillings were removed. I made an application of morphine to the cavities, which I also renewed once or twice, and in a few days the redness and most of the sensitiveness had left them. I then carefully refilled them, she still complaining of some pain from the pressure.

In a few days she returned again, with the teeth looking quite as red, or even redder than before, and complaining of the same kind of suffering as before, and, perhaps, in a greater degree. I again removed the fillings and applied the morphine with the same result as before; and after some further treatment to obtund and to prevent the sensibility, I again refilled them, and without any recurrence of inflammatory symptoms.

It is perhaps but just to remark, in connection with this case, that with all the care I could use in filling those teeth, about one year at a time was all that I could succeed in making fillings remain in them.

Two other gentlemen, in whose skill in such operations I had great confidence, and from an observation of the results of their work for several years, tried some of them one or more times each, and with a knowledge of the fact that I had already tried each of them at least twice, and that I believed they could not be so filled that the operation would be permanent, as a further stimulant to their exertions; but, to their confessed disappointment, with no better result.

About four years after my first operations on her teeth, this young lady died of phthisis pulmonalis.

Since my experience with this case, whatever my convictions might have been before, I have had no doubt that dentine, in some instances, at least, is susceptible of inflammation, and that too in a pretty high degree.

This, I am aware is an extreme case, but it is not altogether an isolated one. I have seen others of a similar kind, but no other so bad as this. But if this case stood entirely alone, it would prove, to my mind, that dentine is susceptible of inflammation,

and it would *indicate* to me that the sensitiveness, so frequently observed in the teeth when but slightly decayed, is true inflammation, but only of a lower degree than this. But it is not necessary to resort to such extreme cases to establish this doctrine.

That dentine is endowed with all the essential characteristics necessary for the development of inflammation, as vitality, nutrition, and secretion, is easily demonstrable.

That it is endowed with vitality is evinced by its sensitiveness when in a normal state, by its greater sensitiveness when diseased, and by its greater powers of resisting the influence of chemical agents, when in a healthy condition, than after its vitality has been destroyed. Dead teeth decay much more rapidly in the same mouth than living ones; crowns of natural teeth engrafted on the roots of other teeth, as artificial substitutes, never last at most but very few years.

That it receives nutrition, from both its internal membranes and from its periosteum, needs no argument now. If that is not an essential part of the office of both these membranes, they would seem to have no office; and nature never makes or tolerates useless things.

That it is endowed with the function of secretion and reproductive—recuperative—energy to some ex-

tent like other bones, though not, so far as known, to the extent of the union of fracture, has been abundantly proved in numerous instances by the filling of teeth where a portion of inflamed, softened and exquisitely sensitive dentine has been left in the bottom of the cavity, the better to protect the nerve of the tooth, and which by thus being protected from external influences, after a time, on removing the filling, has been found, without undue sensitiveness, firm, solid, and healthy.

It is no uncommon occurrence either for a tooth to decay to a considerable extent, with the usual sensitiveness accompanying decaying dentine, and, after a time, from a change in the secretions of the mouth, or other circumstances that originally caused the decay, for the inflammation and sensitiveness to subside, the process of decomposition to cease, and the dentine, that had been softened, to become hard and sound—harder by far than ordinary healthy dentine, and so to remain for many years, and without any local treatment. Is not this the effect of recuperative vital energy?

I know of one case where a right central upper incisor commenced to decay, on its anterior or labial surface, before the crown of the tooth was more than half projected from the gum; and by the time it had acquired its full length the cavity was very large,

occupying about one-fourth of the whole anterior surface of the tooth, and quite deep. The process of decomposition finally ceased, *exfoliation undoubtedly took place*, and the tooth was restored to complete health ; the only apparent defect in it being a somewhat corrugated appearance, and a very slight discoloration of the part. And now, at more than forty years from the commencement of the process of decay, the tooth is entirely healthy and strong. That tooth is my own.

That decaying dentine is susceptible to extreme sensitiveness and pain—most constant concomitants of inflammation—none can deny; and if the affection be not inflammation, what other appellation shall we use better to describe the condition?

In most cases this "exalted sensibility" and pain can be alleviated by some soothing application, or removed by carefully cutting away a thin layer of the diseased dentine, and wholly removed and prevented by cutting away all the diseased portion and filling the cavity with suitable materials, so as to prevent the contact of all irritating substances.

5. *Toothache from Sympathy.*—This most commonly occurs when the nerve of one tooth is inflamed, from exposure or other causes, or its periosteum is inflamed, and the pain is referred to some other tooth; and

that other quite as likely to be entirely sound as diseased. This is a circumstance of very frequent occurrence when one of the lower wisdom teeth is in fault; then the pain is quite as apt to be referred to one of the bicuspidati, or one of the incisors, in either jaw, on that side of the head, as to the tooth that is diseased. In such cases, too, the pain is often complained of in the ear, temple, and scalp, and sometimes soreness of the scalp is also complained of.

A careful examination will settle the point, and it is a good rule never to extract any tooth without being able to give some good reason for it, and a better one than that the patient wishes it done, or *thinks* that it aches. This rule, carefully observed, would save a great many valuable teeth from being simply sacrificed.

Sometimes, too, nervous irritation in other, and even remote parts of the system, produce pains that are referred to the teeth, as uterine affections, affections of the stomach, &c. Quite recently, a very intelligent lady related to me some of her own experience, which forcibly illustrates this point. Some years ago she suffered from a very severe attack of toothache. She applied to her family physician for relief, and he, not discovering the cause of her pain, recommended her to a dentist. He, not observing the rule given above, extracted several of her teeth,

at different times, but without affording any relief. And her sufferings were so intense that she said she believed she should have had all her teeth extracted, if she had not, accidentally, cured herself. She found herself suffering from acidity of the stomach; and for that, took a dose of the carbonate of soda, when almost immediately, and to her great delight, she found her toothache had entirely left her. And, several times afterward, she said, she had had toothache from the same cause, and cured it in the same manner. Of course to extract a tooth expecting to remove the toothache produced by such causes would be the extreme of folly—more, it would be wickedness.

A careful examination into all the circumstances and an application of the rule just given, must be the guide in all such cases.

6. *Toothache from Exostosis.*—Exostosis of a tooth, is a bone-like deposit, of about the hardness and of an appearance similar to the cementum or outer portion of the roots of the tooth; the cause of which is but very imperfectly, if at all, understood. It generally commences at, or very near, the point of the root, but may commence at any other point, and is said sometimes to have been found extending even to their crowns.

The pain from this disease, when it occurs, is probably caused by the pressure it makes on the nerve. Sometimes it is severe when the deposit is quite small, in other cases it is slight, or there may be none at all, even where the deposit is quite large.

Roots of teeth are frequently found with such enlargements upon them, that have remained in the mouth years after their crowns have been entirely removed by decay, and without giving any pain or cause of complaint. Whether the deposit was made before or after the decay of the crown, and loss of the nerve, is extremely difficult to determine. Of course after the nerve was gone, it could not impinge upon that to cause pain. But when it does cause pain, whatever its manner of doing it may be, the only known source of remedy, or relief, is extraction.

The diagnosis of this kind of toothache is perhaps more difficult and uncertain than that from any other cause, and particularly so where the deposit is small; as the tooth then presents no external sign of disease. When it is of considerable size, it generally makes a corresponding protrusion of the alveolus that can be felt with the finger. Probably the surest test, when the enlargement cannot be felt beneath the gum, is rapping the tooth lightly with some small, hard instrument, which, if the cause of the pain be exostosis, will, probably, for the time increase it.

Great caution, however, should be taken about extracting teeth where no other cause can be found than the exacerbation of pain by jarring the tooth, or by even very lightly touching it. It is well to remember that this is not a common cause of toothache; and that without such caution serious mistakes may be, and have been committed; in illustration of which I will relate two rather marked cases.

In the autumn of 1858, a gentleman of this city, of about thirty years of age, came to ask my opinion, and advice, in relation to a very severe pain which he had been suffering, at intervals, for two or three years; and which for the last year had been so frequent, and so severe, that he had been obliged to relinquish a very lucrative business, luckily, however, on a competency. His pain and suffering he referred to the root of the lower canine tooth.

On inquiring into the history of the case, I learned from him, that he had been suffering most intensely, at intervals, as already remarked, for some years. That the pain came on in sudden paroxysms, of which sometimes, he would have very frequent successions during several days or even weeks, and again he would be entirely free from them for a longer or a shorter period. These paroxysms *seemed* to be induced from the slightest causes, as a touch of the tooth, or even of that part of his face, and on that

account, sometimes for several days together, he had hardly been able to take food enough to sustain life; and had been reduced in weight between thirty and forty pounds. He had once had the mental nerve of that side excised, with no effect, except the partial paralysis of his lower lip. As his trouble was increasing, and as his physicians could find no other cause for the pain, and especially as he so constantly referred it to that tooth, and as so slight a touch upon it brought on the paroxysms of pain, although the tooth had no appearance of disease, they advised the removal of the tooth; and about three months before his consulting me, he had applied to a young practitioner of dentistry to have it extracted. He attempted it, without success, but broke off the tooth in part at, and a part below the edge of the alveolus; and, as he could not succeed in removing the root, decided that it *must have* exostosis of the fang, and so told his patient; and that it could not be removed without first cutting away the alveolar process to, or near the point of the root, which was also represented to him as quite an important surgical operation. It was on that account chiefly that he was induced to apply to me.

On hearing his account, and on a close examination of the case, I was satisfied that it was a case of pure neuralgia; that there was no exostosis, and that

the tooth had nothing to do in causing his pain, and that its extraction, or any other mere local treatment, would probably have just as little to do with removing it, and so advised him. But I further advised him, that as the tooth was now broken, and thereby rendered useless; and as the removal of its root might be a relief, and satisfaction to his mind, he had better now have it removed; and I assured him if he wished it, I could remove it without any unusual difficulty. He preferred not to have it done just then, but said he would return in two or three days to have the operation performed. But meanwhile he was called suddenly to go to Philadelphia; and while there having a severe attack of his neuralgia, he applied to some gentleman there—I am glad I do not know to whom—for advice. This gentleman, probably relying on the diagnosis of his young predecessor, who broke the tooth, determined that it was necessary to extract the root; and either for an excuse for demanding a larger fee, or some other unknown cause, determined that in order to enable him to do that, it was necessary for him first to extract the adjoining bicuspid, which was a perfectly sound tooth! This he did! and then chiselled away the septum between it and the broken root, in order to get that out, which, when he had gotten it

out, proved not only to have no exostosis, but to be uncommonly slender and pointed!

And worst of all, after having sacrificed two perfectly sound teeth, the patient was not in the least relieved of his sufferings. His disease was beyond reasonable doubt *constitutional*, not local.

While on this subject of neuralgia, as it is too common a cause of mistakes of this kind, I will relate another case, analogous to this.

In 1857 I was called in consultation with a medical gentleman to see a young lady, of about seventeen years of age, small in stature, of delicate constitution, and of nervous temperament. For several months she had been suffering most intensely from neuralgic pains, which she referred to her teeth. On examination I found all the teeth she then had, as well as her gums, and all other parts of her mouth, apparently in the most perfectly healthy condition; but she had already had all the molars and nearly or quite all the bicuspidati of both jaws extracted, with the hope of finding relief. She now wished to have, and had insisted on having, one of her upper canine teeth removed; but the physician then in attendance, both from a knowledge of the fact that she had experienced no relief from the removal of the many that had already been sacrificed, and from the firm belief that she needed constitutional, and

not local treatment, advised the asking of my opinion; and, at his request, I was therefore called in consultation.

I fully concurred in her physician's opinion; and though tearfully implored by the young lady, declined to extract the tooth; knowing, and assuring both her and her widowed mother, that it would be but a sacrifice of the tooth without affording the least hope of relief.

I am sorry to feel compelled to add, that this young lady went to the gentleman who had already mutilated her so sadly, by taking out the most of those she had already lost; and he, although he was aware of the opinion, at least, of her medical adviser, and of the fact that what he had already done had been of no avail, was, either through ignorance or cupidity, or both, induced to extract the tooth, and of course with no better results than had attended his former operations. Great care then should be taken not to be deceived into the belief that all painful affections referred to the teeth are toothache, and require the extraction of the teeth.

But there are some affections which frequently come under our observation and care, and which often require the extraction of the teeth, that are not properly toothache, though generally so denominated, of which we must not here fail to speak.

One of the most common and painful of these is that caused by the cutting of the wisdom, and more especially of the lower wisdom, teeth.

There are several kinds of difficulty and trouble from this cause. One common one is owing to the fact that these teeth are very liable to assume irregular positions: as, for example, the grinding surface of the tooth, or, in such a case more properly, its multicuspidated surface, may present itself to the cheek, when, if its cusps happen to be pretty sharp or a little rough, they may produce irritation or inflammation, swelling and pain; and on this account, unless a file can be brought to bear upon them, so as to remove such sharp or rough points, may require to be extracted.

A file may be used to remove such sharp points of enamel without producing soreness, as would be the case if the dentine were exposed, or injured by it; and although on the enamel its use is likely to cause decay in such cases, it is the less of two evils, and is therefore allowable.

But a more common and much more troublesome condition is where, from the narrowness of the space allotted to them at the posterior portion of the jaws, there is not room for their full development. If, in such cases, the upper tooth precedes the lower for a considerable length of time, as frequently happens,

so that the upper has acquired its full length, or by having nothing to oppose it, perhaps a little more than its proper length, thus occupying more than its due proportion of the limited space allotted to both, when the lower advances near to the surface it raises the gum so as to bring it in contact with the upper tooth at every occlusion of the jaws. This bruises the gum, perhaps already irritated, and produces inflammation, great discomfort, and pain. Here, sometimes, an incision, or sometimes better, a small excision, may give entire relief, and avoid all further trouble. But if the space between the jaws be too narrow ultimately to admit the protrusion of the full length of the crowns of these teeth, as there can be no attachment of the gum to the enamel of a tooth—enamel having no periosteum—a cul-de-sac or pouch will be formed, of a depth equal to the unprotruded portion of the crown. And if there be only room—as is by no means uncommon—for the protrusion of one or more of its cusps before meeting the opposing tooth, then this sac will be of a depth equal to the whole length of the crown. This sac forms a ready receptacle for food or any other matters taken into, or secreted by, the mouth, to lie in and decompose; and this may produce inflammation, ulceration, the burrowing of pus deep in the cellular tissue; forming abscess, causing necrosis, exfoliations,

and all the other ills consequent upon severe inflammation. These more severe lesions consequent upon the coming of the wisdom teeth, so far at least as my observation goes, are confined to the lower jaw; and for the reasons, first, that I believe the upper wisdom teeth are usually first in coming, and are therefore the most fully protruded through the gum; but chiefly for the reason that if food or other substances were forced, by mastication or otherwise, under the edge of the gum on the upper jaw, the force of gravitation would constantly tend to remove it, and would, generally, do so before it could do much harm; whereas in the lower jaw, the same force would as constantly tend to keep it there.

When the parts are in this condition, the only effectual remedy that I have ever found, or seen tried, is the removal of the teeth; thus allowing the gums to contract, heal, and obliterate the sacs.

I advise *feelingly* on this subject, having been obliged to have both my own lower wisdom teeth removed for this cause.

A deposit of tartar upon the teeth often produces a low grade of inflammation of the gums and *peridentinum*, usually taking a chronic form. This sometimes produces a dull pain—pity it did not always produce acute pain and from its earliest stages—and, for the relief of this pain, we are sometimes called

upon to extract the teeth. The entire removal of the tartar, and proper local treatment, which should generally consist of a wash of some of the stronger vegetable astringents, made stimulating by the addition of a little of some of the essential oils, or alcohol, and the frequent friction of a brush, and, if need be, in addition, some constitutional treatment, will generally effect a speedy relief and an effectual cure. Sometimes, however, especially on the lower teeth, the deposit, if long neglected, may have extended so near the point of the root as to render the entire removal of it impracticable, then extraction sometimes may, though very seldom, be required to afford relief.

Sometimes when the teeth naturally stand slightly apart, or have been separated by the file or otherwise, food, while being masticated, may be forced through these spaces upon the gum with sufficient force to induce inflammation, and thus produce inconvenience and pain. The pain in such cases is generally not very severe, and, with a little care on the part of the patient, is not of very long duration. To extract a tooth for such a cause would, of course, be too great a sacrifice.

From the foregoing remarks we may readily deduce some pretty definite general *rules* to guide us in the extraction of teeth, or at least by which to

determine pretty nearly what teeth require extracting, and what ought not to be extracted.

1st. Any aching tooth, the crown of which is so far destroyed by caries that it cannot be restored to usefulness by being properly filled, should be extracted; unless the tooth be one of the upper incisors or cuspidati, the roots of which are often important on which to engraft artificial crowns. In such cases great pains should be taken to preserve the roots and to restore them to health, irrespective of the state of their crowns.

2d. Any tooth whose pulp is exposed, and either the tooth or the cavity in the tooth is so situated that it is impossible to get at and to thoroughly cleanse and fill its roots, as well as the cavity caused by the decay.

3d. All aching teeth that have caused abscesses that have produced, or are producing, such lesions of the surrounding parts as to preclude a reasonable prospect of cure.

4th. Such aching teeth as have exposed or inflamed pulps, or incipient abscess, or have become painful from any other cause, and have already been rendered useless by the loss of their antagonists in the opposing jaw.

5th. All old roots of teeth that produce pain, from inflammation, or whose ragged edges are pro-

ducing inflammation in the surrounding gums, or are in any other way causing injury.

6th. Wisdom teeth not having room between the jaws for their full development, and which from that cause, as before described, are producing inflammation and pain.

7th. All painful teeth unmistakably affected with exostosis. And besides these causes,

8th. It is sometimes proper to remove even healthy and sound teeth: as where, for example, one has already lost most of his teeth, and those remaining are useless by not standing opposite to each other; or if there is only an occasional one left in the mouth, and the person wishes to be supplied with artificial substitutes, which by this means may be made much more serviceable than they can be with a few scattering natural teeth left remaining. But here, and in all other cases, too much care cannot well be used to avoid the removal of teeth that are useful, or that by suitable skill and care can be made so.

But when any of the conditions exist in such force as to require the extraction of a tooth, I scarcely can conceive of any circumstance that would contraindicate the immediate performance of the operation, though some writers point out many such circumstances. A few of them we will examine.

I have seen the following conditions set down as

indicating the necessity of great care—by which I suppose is meant unusual care—in the operation of extraction, or of prior treatment, or of forbidding the extraction of the teeth altogether, to wit:

"Extreme debility."

"Great nervous irritability."

"Excessive local inflammation, especially where it tends to the other parts."

"Much irritability of the parts immediately connected with the teeth."

"Pregnancy, and all uterine irritations."*

Now to my mind, most, if not all of these conditions, instead of being causes for altogether refraining from extraction or of delaying that operation, would be cogent arguments for the performance, and for the immediate performance of the operation.

All possible care and gentleness should be used under all circumstances where extraction is required.

Now, since there can hardly be a better established principle of surgery or medicine than that the readiest way to remove any disease is to remove its cause, I can scarcely conceive of a more sure cause of debility than the severe sufferings from toothache, and the loss of appetite, and sleep and rest occasioned by such suffering; therefore, if the pain could not other-

* Taft's Operative Dentistry, p. 342.

wise be readily effectually palliated so as to give rest and comfort, and if the patient were not already moribund, I should regard debility, to almost any extent, an urgent cause for extraction, and that immediately, and should expect by it, not to increase, but to relieve the debility. And as I can scarcely conceive of anything more directly calculated to keep up and to increase "great nervous irritability," or to excite and maintain "excessive local inflammation," whether "it tends to the other parts" or not; or to excite "much irritability of the parts intimately connected with the teeth," than a diseased and aching tooth, if I saw any or all of these conditions accompanying, I should consider each one an additional reason for the immediate extraction of the irritating cause. This would certainly be my general rule, though there might possibly, sometimes, be such extreme cases of irritation and debility as would require delay, for improvement in the general condition, lest the shock of the operation prove too severe for the enfeebled powers to endure; but whenever such a case occurs, great care must be taken "that the patient does not die in getting well."

Of the expediency of extracting teeth, in ordinary cases, during pregnancy, there may perhaps be better grounds for different opinions. That there is a pretty strong sympathetic influence existing between the

uterus and the teeth, and manifested most particularly when that organ is in the gravid state, there can be no doubt, as it is not uncommon when in that state, or when it is in an irritable condition from other causes, for it to produce strong sympathetic influences even on sound teeth, so as to occasion great discomfort, and lead to the impression that they should be removed. Too much care, of course, cannot be observed to avoid falling into such mistakes. But, although we admit the great sympathy between the teeth and uterus, and that any great violence to the teeth may make a very distinct impression there, and especially when in the gravid state, I cannot regard pregnancy as a valid objection to the extraction of aching teeth, the pain of which cannot otherwise be palliated. By theory, and by practice, I have ever maintained that the danger of abortion is greater from the constant pain and sympathetic irritation, and the debility consequent upon the loss of rest and sleep, than by the operation; and although I have extracted teeth for many women while in that condition, I have never yet known any untoward results to follow. Still, I can well conceive that in a feeble person, of great nervous irritability, especially if she had previously been subject to abortions, the extraction of a tooth, and more particularly if the operation be roughly performed, might produce

that result. Therefore, in such cases, it would be but prudent to try the effect of palliatives; and if these afford a tolerable degree of comfort, extraction is safer omitted; but if these do not afford relief, it is but a choice between two evils, of which extraction will generally be found the less, but circumstances may sometimes render it the greater; of which every judicious practitioner will necessarily judge for himself at the time.

CHAPTER IV.

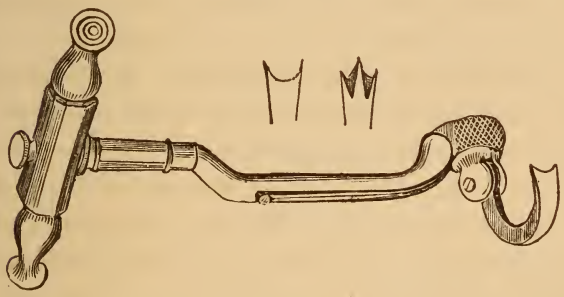
INSTRUMENTS USED FOR EXTRACTING TEETH AND THE PROPER METHOD OF USING THEM.

Sec. 1. Having now studied the anatomy of the teeth and jaws, and, from a consideration of the pathology of toothache, seen what teeth require extraction, we next come to consider the instruments used, and those most appropriate to be used, in the operation; as well as the most proper methods of using them. They are of various kinds, and to be fully prepared to extract all classes of teeth, and under all conditions and circumstances, requires a considerable variety; but there are some kinds of instruments, and in very general use, that ought entirely to be laid aside, and never more to be used; and many instruments of a proper kind—or at least bearing the names of the proper kinds of instruments—are so badly constructed as to render them but little, if any, less objectionable. Some of these I shall describe, and the mode of their action, only to caution all, and especially beginners, against their use.

The instrument which is probably in more general use for the extraction of teeth than any other single instrument, and by the use of which more accidents and injuries are committed than by all other extracting instruments combined, is the turnkey; therefore from its great power to do evil, as well as its extensive use and antiquity (having been invented, as it is said, near the beginning of the last century, or about one hundred and fifty years ago), seems to require some notice.

This instrument of torture, and of dread, consists of a steel shaft about five inches in length, and the

Fig. 20.



fourth of an inch in thickness, either straight or bent, much or little, and in various ways, the better to facilitate its application. On one end of this shaft is a horizontal projection or fulcrum, of various lengths, sizes, and shapes, and either fixed to the

shaft or attached to it by a kind of hinge, to suit the fancy of the maker or operator. To this end of the shaft, too, is fixed a movable hook or claw, with which to grasp the tooth. On the other end of the shaft is fixed a transverse handle, about three and a half inches long.

When the instrument is applied, the fulcrum rests upon the gum and edge of the alveolar process on one side of the tooth to be operated on, while the hook or claw is placed in contact with its neck, on the other side.

"This instrument may be regarded in the light of the wheel and axle; the hand of the operator acting on two spokes of the wheel, to move it, while the tooth is fixed to the axle by the claw."

It is plain from this description, or from a glance at the instrument, and the situation of any tooth in the jaw, that the lowest point at which the claw can be brought in contact with, and take hold upon the tooth, can be but very little, if any, below the level of the bearing of the fulcrum on the opposite side; and therefore the force applied to the tooth is not in the direction of the axis of the tooth and its socket; but, even when best applied, under the necessities of the case, it must be diagonally across it; and that, by this means, that part of the tooth next to the fulcrum must impinge strongly on that side of the

alveolar cell, while the end of the root, or roots, must as strongly impinge on the bottom of the cell at the opposite side, thus necessarily requiring a greatly unnecessary amount of force, by this indirect manner of applying it, as well as to overcome a large amount of friction occasioned by this indirect or lateral force. It is plain, too, in theory, and practice has a thousand times proved it, that if the tooth be an upper molar, with roots much divergent, some or all of them must be broken, or the alveolus be wrenched away, before the tooth can be removed from its socket, by applying force in that direction.

All this is on the supposition that the instrument is as well constructed and applied as it can be, with the point of the claw below the bearing of the fulcrum. But supposing that, by carelessness, inadvertence, or accident, the fulcrum is below or on a line with the point of the hook, then the only action of the force applied is across the tooth, and the only effect must be either to break it, or to split and wrench away the side of the alveolus, probably accompanied with bruising and laceration of the gums; all or either of which are unpleasant accidents.

Another objection to this instrument not to be overlooked or ignored, is the liability, from the sudden starting of the patient or from other causes, of the instrument to slip, even in careful hands, from

the tooth to which it was applied, to the space between it and the tooth next in front of it, or even to the next tooth, thus taking out two teeth instead of one, or at least the wrong tooth!—a serious and a mortifying accident, that many a man has been subjected to, and by which many a patient has suffered.

Much useless labor and thought has been expended in trying to invent a key, whose force should act in the line of the axis of the tooth to be removed; but if it could be accomplished, the labor and the thought would still be useless, for the instrument when done would be altogether objectionable, and even wholly inadmissible, in practice; for it must require a force in removing a tooth sufficient to rupture all the membranes at the same instant, and if its roots diverge from each other, to break them or tear up the alveolar processes.

The key, in any form, is a powerful instrument, but, at the best, a dangerous and a barbarous one.

During the first ten years of my professional life, I used it often, and because I was so taught; and although I never had any very serious accident occur from the use of it, I never once in all that time took it in my hand, to extract a tooth, without feeling a degree of anxiety about the result.

The Conical Screw is another instrument that has been long used for extracting certain teeth, and its

virtues much vaunted, which is of very little use except in theory. It is at most applicable for the removal of the roots of teeth in the upper jaw, and

Fig. 21.

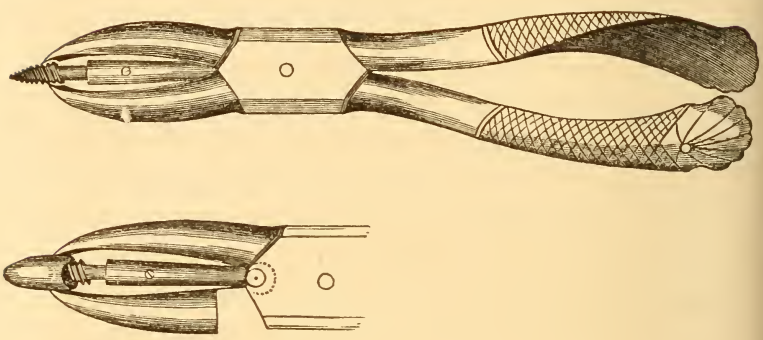
more particularly to those of the incisors and cuspidati.

It is applied by inserting its point into the decayed, and thus enlarged, canal of the root, and by a gentle force and a rotary motion causing it to cut a thread in the root, corresponding to the thread in the screw, and thus securing a hold by which to remove it.

The chief objections to this instrument are, that it is but seldom that it can be made to cut a thread in the root of a tooth strong enough to answer the purpose intended; if the root is any ways long and firmly set, and if it be but short and frail, before a sufficient thread be cut by which to remove it, it will probably be split into fragments, and the operation thus complicated. And when it can be made to answer, especially if the root be sore, from inflammation, it will cause a great deal more pain than a more suitable instrument. And finally, *it is—of no practical account.*

A great deal of angry controversy was carried on, a few years ago, in some of the dental journals, as to who was entitled to the honor of inventing an instrument, called a compound screw forceps, and combining the screw and the forceps. It consists of a pair of common straight forceps, with a conical screw, with its shaft inserted into a cylinder, one end of which is let into the joint of the forceps, so that it

Fig. 22.



can play between the blades like the clapper of a bell, and the screw so arranged by a spiral spring in the cylinder, that it can be thrust out from the blades somewhat like the tongue of a serpent, to be seized by the blades of the instrument, and screwed into the hollow root; and then the blades opened, and made to grasp the outside of the same.

The operator, however, will generally find, in

using this instrument, that after he has carefully inserted the screw into the root, and carefully applied the blades upon it, and carefully made rotation and traction, he has very carefully brought away his whole instrument, and a small portion of the almost friable edges of the root, and nothing more, leaving the greater part, and the important part, of it in the jaw, to be removed by some more effective means.

I once spent considerable time, labor, and pains, in describing, for the inventor, what I believe was the first instrument of this kind ever made; but the instrument, when perfected, was never, to me, worth half the trouble it took to describe it.

There are various hooks and punches, for removing roots of teeth; and chisels for chipping away the alveolar processes, to enable the operator to grasp roots and broken teeth, and to facilitate their removal, which are often, if not most generally, found in extracting cases, all or any of which may be made to answer the purpose for which they are intended, but are very ill adapted to the purpose, and ought to be regarded as only so much useless lumber.

But to be fully prepared for all cases and emergencies that occur in extracting teeth, quite a variety of instruments are certainly needed, but if they are good, well made, properly constructed by being well fitted to the teeth on which they are intended to act,

a smaller number will be much more efficient, and useful, than ever so many of bad quality, bad construction, and ill adaptation.

But to be thus thoroughly prepared for all cases in both temporary and permanent sets, each extracting case should be supplied with at least fifteen pairs of forceps. And, although a smaller number may be made to answer, in all ordinary cases, circumstances arise, and cases occur, where even more than this will be found convenient. Of these there should be three pairs of straight forceps, designed chiefly for the upper incisors and cuspidati, one pair of upper bicuspid forceps, two pairs upper molar, one pair lower incisors and cuspidati, two pairs lower cuspidati, and one pair of lower molar forceps, a similar set of small molar, adapted to the size of the temporary set, and one pair of quite small straight forceps for the incisors of the temporary set; these will also be found useful for removing loosened roots or fragments of bone; also one or two pairs for irregular teeth, and one pair of quite small root-forceps for the lower jaw. This last pair is perhaps the least essential of any, but will often be found very convenient.

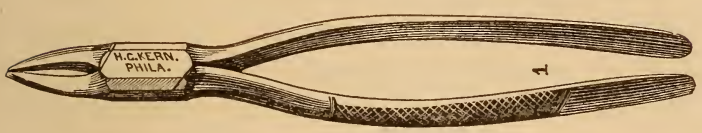
Besides a good supply of forceps, each case should contain two elevators, and one gouge.

All these instruments should be made of the best cast steel, and be of the most perfect spring temper,

as this temper affords the greatest amount of strength with the same weight of metal, and an instrument that has a slight amount of elasticity not only breaks less easily, but takes something from the disagreeable shock produced by an entirely unyielding instrument, and is also, on that account, less liable to break the tooth to which it is applied.

The first pair of straight forceps should be rather small, with delicate, evenly tapered, well-tempered blades; their points finished down to sharp cutting edges, and slightly rounded or gouge-shaped, so that they can be readily and easily carried under the gum, cutting their own way quite to, or, if necessary, even beyond the edge of the alveolus. The general form

Fig. 23.



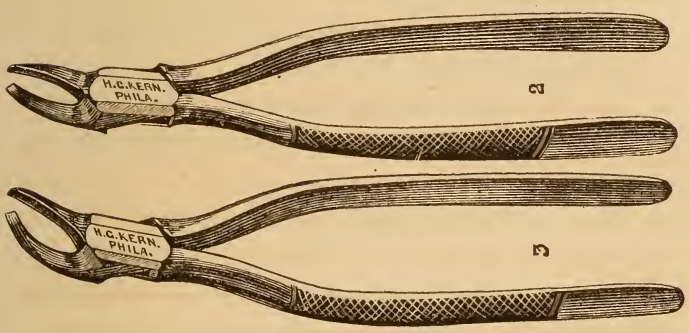
of the blades should be a segment of a somewhat conical cylinder; and, as by a recurrence to the description of the form of the roots of the single-rooted teeth, it will be observed that the outer portion of the root is larger than the inner, it will readily be seen, that in order that the forceps should fit the root correctly, one blade of the forceps should be the

segment of a somewhat larger cylinder than the other. They should be as wide as the tooth to which they are applied will admit, allowing sufficient space for a slight rotary motion, without bringing the sides of the instrument in contact with the adjoining teeth. The importance of this is evident, from the plain fact that an instrument so narrow, or with jaws so nearly plain on their inner surfaces, that when applied they would bear on two small portions only of a tooth, which is in fact a cylinder, would readily crush it; whereas, if the same tooth or root was encircled, to a considerable extent, on two of its sides, it would bear almost any amount of force without being crushed; and besides this, if an instrument so inclose a tooth, there is far less liability of its slipping, in giving the necessary rotary motion to rupture the membranes that confine it to its socket, than if seized by a smaller surface. But as the same class of teeth in different individuals vary materially in size, and as the central and lateral incisors and the cuspidati, in the same individual, always are of different sizes, it is obvious that no one instrument, nor any two or three instruments, can thus accurately fit all the teeth to which they are to be applied; but by carefully fitting one instrument to a tooth about the average, or a little above the average size, and

another to one a little below that size, the two can be made to answer, very well, in all ordinary cases.

Their blades, or jaws, should also be set so far apart at the joint, that when their ends have firmly grasped the neck of the tooth, they shall not impinge upon and crush their crowns; nor in doing this, should the blades be much if at all curved, but they should rather approximate each other in direct lines from their joint to their points, otherwise they will act to some extent as excising forceps, and are therefore liable to break the tooth, instead of extracting it.

Fig. 24.



The comparative length of the blades and handle of the instrument is also of some importance. If the blades are too short, in proportion, the leverage of the handles will be so great, that a sufficient amount of force to extract the tooth, will crush it; and on

the other hand, if the blades are too long, an extra amount of force beyond what is necessary to extract the tooth, will be required, by the grip of the hand, to prevent the instrument from slipping from the tooth, while, of course, the tractile force of either instrument would be precisely the same, provided the entire length of each of the two instruments was the same. Therefore, a proper medium should be observed in this regard. This principle holds in relation to all classes of forceps. What I would regard as about a fair proportion would be, if the whole instrument were seven inches in length, the jaws should be about from one inch and three-eighths to one inch and a half, measuring from the centre of the rivet.

This size of straight forceps are to be used generally for extracting the smaller central and the lateral.

The next pair should be of similar form and construction to those just described, but wider, heavier, and stronger, and are to be used in the extraction of the cuspidati and some of the larger and more firmly set central incisors.

The third pair should also be rather heavy and strong, though not necessarily quite as heavy as the last described. They are a kind of semi-cutting forceps, intended especially for the removal of the roots

of the incisors, cuspidati, and bicuspidati, when one has been so unfortunate as to break one of these teeth in attempting to extract it. This is commonly known as the Parmly forceps, and is a most useful and almost indispensable instrument. The blades of these forceps are shaped very nearly like a carpenter's "pod bit" or gimlet, with sharp cutting edges at their ends, and for about three-eighths of an inch along their sides; and are hollowed out on their approximal sides about as deep as the thickness of the

Fig. 25.

alveolar process, so that, when applied, they may fully cut through the process on each side, but without cutting the root of the tooth.

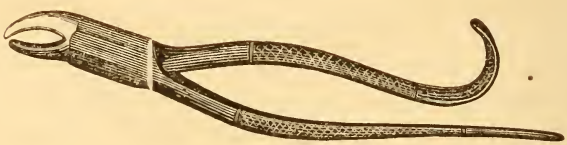
Before applying this instrument, the gum should be slit along the course of the root to be removed, and dissected from the alveolar process, far enough to admit of its free and easy application. It is then applied over the process, on each side of the root, as far up as is deemed necessary, from an eighth to a fourth of an inch usually, when with one stroke of the forceps, the process on both sides is completely

and smoothly cut through, and the root at the same moment firmly seized, which is then, of course, very easily removed, as its attachments are so nearly all cut away.

There is no instrument that I have ever used with greater satisfaction than this. It does at one motion, smoothly, effectually and with greater ease to both patient and operator, all that can be done by tediously and roughly and painfully chipping away the alveolus with chisel and gouge and mallet, and after that the use of forceps, or punch, or turnkey, as is the habit of many.

In selecting or having upper bicuspid forceps made, the same care should be observed in relation to their fitting the necks of the teeth on which they are intended to be used, without touching their crowns.

FIG. 26.

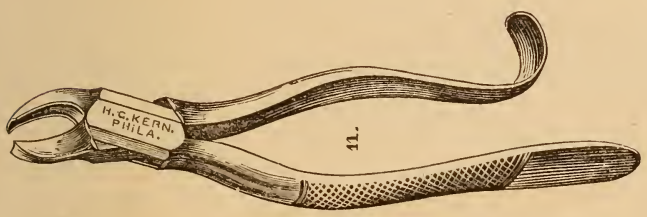


Nor should they bear upon the very end of the instrument only, for if so, they do not hold the tooth firmly, and they act besides as cutting forceps.

Their blades should, also, like the straight forceps,

be cylindrical, so as to encircle so much of the tooth as is admissible, and the blade intended for the inner or lingual side of the tooth should be a little smaller than the other. The points of these forceps, too, should be sharp, so that they will pass readily under the gums, cutting their way, and not bruising it. Many of the forceps of this kind that are offered for sale are both too blunt and too much curved in their blades, so that they are bungling to apply, and when applied their bearing is too directly—too entirely—on their very points, making them act either as cutting forceps, or else allowing their handles to rotate

Fig. 27.



on the points of the instrument, until the crown of the tooth impinges on one blade of the instrument, while the point of the other blade acts as a fulcrum over which to break off the tooth. Another common objection to this kind of forceps is, that the blades are set at too great an angle to the handles,

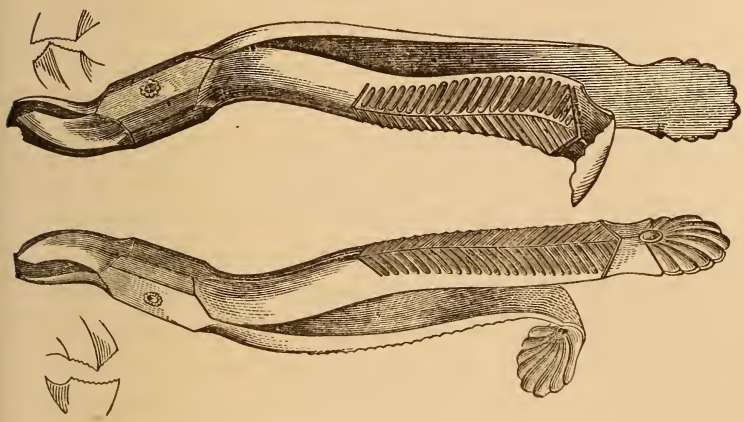
either for effectiveness or convenience. Indeed, forceps for these teeth made entirely straight, with the blades a little narrower than the common incisor forceps, but enough thicker to give them their requisite strength, and set enough further apart at the joint to clear the greater thickness of the crowns of these teeth, is quite as convenient as any other form. And as the same instrument is equally adapted to each side of the mouth, if both handles are made alike, it is more convenient than if one is bent to fit around the little finger.

Great care should also be taken that the upper molar forceps—which must be rights and lefts—are well adapted to the class of teeth on which they are to be used, as well as to the hand. Their general form is so well established and known that a definite description can hardly be deemed necessary, or any suggestions on that head, further than that they are generally made more crooked than is either necessary or convenient, and as each forceps is always used for its own definite side of the mouth, they afford a firmer and securer hold for the hand if one handle is bent around the little finger, than if both are made straight. But as correct adaptation—accuracy of fit—of the instrument to the tooth, both for efficiency of action, and to avoid, as much as possible, the breaking of the teeth or other accidents, is a consid-

eration of prime importance, I shall describe this part of it somewhat minutely.

As the upper molar teeth have, almost uniformly, three roots, two external and one internal, it is evident that, to fit the tooth accurately, the blades of the instrument must be of entirely different forms. Thus; the internal blade must be a single concave or

Fig. 28.



crescent shape, and of the width of the neck of a medium-sized tooth of that class. The external blade, at its point, must be a double concave, with a point between, to fit into the bifurcation of the external roots. But, as these external roots are of unequal sizes, the anterior being larger and also more

prominent than the other, so the grooves or concavities in the blade of the instrument must be of different sizes to fit them; the anterior groove being both larger and deeper than the posterior, otherwise the bearing of this blade will be only on the anterior root, and the point, intended for that purpose, cannot reach the bifurcation of the roots; the result of which would be that the instrument is liable to slip altogether from the tooth or to glance off against the posterior tooth, endangering it; and even if it do not slip it is more liable to break the tooth than if it fitted it accurately. The relative difference in the size of these grooves should be about as three to two; that is, the anterior groove should be about three-fifths, and the posterior about two-fifths of the width of the instrument; and the anterior should be nearly or quite twice the depth of the other. The point should be distinct and prominent; thick enough to give it strength, and turned slightly inwards, so that when once fairly applied to the bifurcation of the roots, there can be no possibility of its slipping; or so that if necessary, as frequently happens, when the crown of the tooth has been broken off, it can be placed over the alveolus, piercing through it and taking hold in the bifurcation of the roots.

The first and second upper molars are so nearly alike that an instrument well adapted to one will

answer equally well for the other. The roots of the upper wisdom teeth are so frequently close together or all condensed into one, and as they do not usually require much force to remove them, an instrument with a less prominent central point, or even one, both blades of which are a single concave, will often answer better.

Fig. 29.

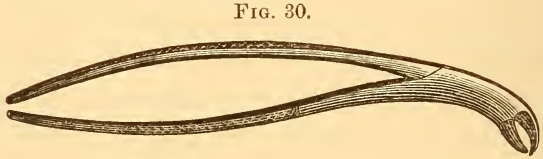
Lower Root Forceps.

For the removal of the lower teeth, and their roots, as already intimated, four or at most five pairs of forceps are all that are necessary. One pair for the incisors and cuspidati, one for the bicuspidati, one for the removal of the roots of the teeth when it is necessary to remove a portion of the alveolus to get at them, and one pair for the first and second molars on both sides. Some, and perhaps most, operators use two pairs for the lower molars, rights and lefts, but one only is better. A small pair of lower root forceps, with very small blades, and the points of which come close together, will sometimes be found very convenient for picking away loosened roots, or fragments

of the alveolus, or fragments of teeth that may have been crushed in attempting to extract them; but although sometimes very convenient, they are not very essential.

The only difference required between the forceps for extracting the lower incisors and the lower bicuspidati is, that those for the incisors should be narrower in their blades than the others. Those made by Toland and Chevalier and some other makers, are tolerably well adapted to the purpose; though I like them better more bent in their joints than they are usually made, as then when applied it brings their handles, and of course the hand, further from the patient's face. I have mine represent an angle of something more than forty-five degrees.

Fig. 30.



The pair for the removal of the roots of such bicuspidati, or indeed of any other of the single-rooted lower teeth, the crowns of which have been broken off in attempting to extract, and are so firmly set, or broken so far below the edge of the alveolus, as to render it impossible or inconvenient to remove them

with the elevator, or even the roots of the lower molars, if broken below their bifurcation, was invented by myself in 1858. Their *general* form is the same as my ordinary lower bicuspid forceps, but having the pod-bit or gimlet-shaped blades, described for cutting the alveolar processes, and removing the roots, of such broken upper teeth; and is used in the same manner as that instrument, *i. e.*, by first

FIG. 31.

dissecting away the gum, and inclosing a sufficient amount of both the processes and the root, within the jaws of the forceps; then cutting the process and removing the root at a single stroke; which is effected so easily as often to surprise both patient and operator. I find this, now, an indispensable instrument, and can hardly understand how I got on so long without it; and am sure that no one who had once used it, would consent to be without it.

The lower molar forceps, which are generally offered for sale, unlike those for the upper molars, which are generally too crooked for effectiveness or

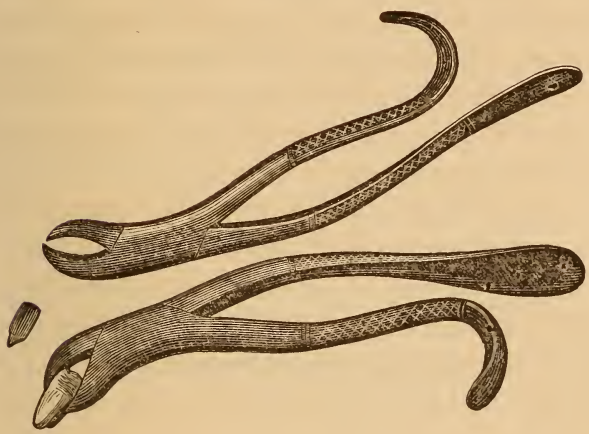
convenience, are usually too straight. Their beaks should be bent downwards, *one blade above the other*, at an angle of at least forty-five degrees from the line of their handles. They should have a bend at or just in front of the joint, so that when applied it shall throw the handles to the front of the mouth; they should then have another bend, to bring the handles back nearly on a line parallel with the blades, for the nearer the handles and blades are to being on a line parallel to each other, so much the more directly will the force applied to the handles act on the object grasped by the blades.

The ends of the blades should each be formed into two grooves, or a double concave, to fit them accurately to the necks of these double-rooted teeth, and with a centre point to enter the bifurcation; and these centre points should be made longer, more hooked, and more pointed than they are usually made, or than I have ever found them at any of the "dental depots,"—a full fourth of an inch from the outside of the groove being quite short enough. The anterior roots of the lower molar teeth being larger and more prominent than the posterior, these grooves should be of a width and depth to correspond, *i. e.*, the anterior should be deeper and wider than the posterior. Forceps thus made, when fairly applied, seize the tooth firmly; there is no danger of their slipping,

and very little danger of ever breaking a tooth in attempting to extract.

With an instrument thus shaped, the mere act of applying it is often sufficient to remove the tooth, for these long tapering points having fairly entered

Fig. 32.



the bifurcation, the upper side of each point, as it is further forced in, bears hard upward on the tooth, while the other bears as hard upon the edge of the alveolus, thus acting like two little wedges, and with sufficient force to raise the tooth from its socket, by simply closing the instrument upon the tooth.

Another great advantage of this form of beak is, that when the crown of a tooth has been broken off

above the bifurcation, that is, without separating its roots, the gum can be dissected from the alveolus for a short distance, and the instrument applied in the line of the bifurcation, and low enough down to secure its points entering there, when, with but a slight force upon its handles, the beaks will pierce the alveolus, firmly seizing the roots, when they may be easily and securely removed, and without any chipping or hacking of the alveolus, and in less time than it takes to describe the operation.

These forceps, like all others, should have their blades wide enough apart, that, when firmly applied, the crown of the tooth shall be perfectly free, otherwise it will very likely be crushed or broken.

I will here remark, *en passant*, that when only one pair of forceps is used for the teeth on both sides of the lower jaw—and it is much more convenient and effective than rights and lefts—it should be the one made for the right side.

Besides the forceps already described, it will sometimes be found very convenient, for every one who extracts many teeth, to have one or two pairs with very narrow, but, at the same time, very strong blades, for extracting irregular teeth. Several very good patterns of this kind can be found in most of the principal dental depots.

The forceps for extracting the deciduous teeth

should have the same forms as the corresponding instruments for adult teeth, but of only about half their size. And such a set, consisting of about three instruments—that is for the molars—are very necessary. But I cannot refrain from remarking here, that these instruments should be used very sparingly, as great harm is done by the indiscriminate extraction of children's teeth.

Of the elevators, one should be the common straight, spear-shape-headed elevator of the depots, modified and greatly improved by having its head about one-third smaller than they are usually made,

FIG. 33.

Front view.

Side view.

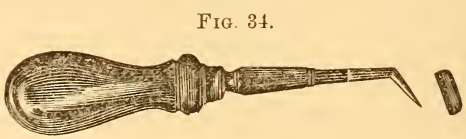
or to be more particular in its description, it should be, in its entire length, about five and a half inches. The handle, the foundation of which should be a flattened continuation of the shaft, covered on each side with ivory, ebony, hardened rubber, or other suitable material, should be about three and a half inches in length, by about half an inch in width. The shaft should be gracefully tapered from the

handle to the head, and about an inch and three-fourths in length. The head should be about one-fourth of an inch, or a little more, in length, and a fourth of an inch, or a little less, in its greatest width, and tapered to a point. One side of the head should be flat, or very slightly concave, and the other side oval, and at its thickest part it should be nearly an eighth of an inch thick. The head of the instrument, regarding the flat surface as the front, should be bent backward, at an angle of fifteen or twenty degrees from the line of the shaft. This greatly facilitates its application, and adds much to its power.

This instrument is sometimes very useful in extracting roots of teeth, but more especially for extracting the lower wisdom teeth. But, of its use, I shall speak more fully when treating of the extraction of the wisdom teeth.

The other elevator should be about five inches or a little less in length, including its handle, which

FIG. 34.



should be about half the whole length of the instrument, round and well fitted to the hand. Its blade

should be about half an inch in length, and set at an angle of full forty-five degrees from the line of its shaft. Its form and size should be that of the same length cut from one blade of a medium-sized common straight pair of forceps, the concave side front; its point sharp, and slightly rounded, or gouge-shaped.

This instrument is used chiefly in the extraction of the roots of teeth, and is applied by placing the concave side of its point against the root to be removed, carrying it down perpendicularly, as far as practicable, between the root and its alveolus, then depressing the handle, thus using the edge of that process to some extent, as a fulcrum over which to pry out the root; or else with an upward (if in the lower jaw, downward if in the upper) motion, push or force the root from its socket.

This elevator is applicable to the roots of all classes of teeth, and is more serviceable in extracting roots than any other single instrument, or perhaps than all other instruments combined; and especially if they be very badly decayed and frail roots. Its sharp rounded point can readily be thrust some distance between the root of almost any tooth and its alveolus, at the same time rupturing to some extent, on one side at least, its articulating membrane, periosteum or peridenteum, as it is sometimes called, and securing a good hold on the root, without danger of

breaking or crushing it, with much less pain to the patient than the application of forceps, as it comes in contact with but one side of the root, and very rarely requires any lancing of the gum: all material advantages, both in its application and use, over either the forceps, or the elevators with serrated or bifurcated points, as they are most generally made.

The gouge, of the extracting case, should be, including its handle, about six inches in length, three-

Fig. 35.

sixteenths of an inch in width, and shaped like the *Turner's* gouge.

This is used for the removal of the roots of the teeth that are decayed or broken off so high up in their sockets as to be beyond the reach of the elevator. It is generally applicable only to the upper jaw. It is applied by passing it up the cell of the alveolus, until it reaches the root, and then carefully inserting its edge between it and the parietes of its cell, when, with a gentle pressure and a rotary motion of the instrument, the fragment of root is at once and easily removed, with very little trouble to the operator, and usually with but comparatively little pain to the patient.

In this manner I have removed the point of a canine tooth, not more than three-sixteenths of an inch in length, and broken off full three-eighths of an inch above the edge of the alveolus, where no other instrument could possibly reach it, without first cutting away at least half an inch from the alveolus; and, of course, involving a pretty severe wound in the contiguous soft parts.

This is truly a very valuable little instrument; and no extracting case should be considered fully equipped without it.

Having described the necessary, and, as I think, the most appropriate and best instruments for extracting all classes of teeth, and roots of teeth, in the easiest and best possible manner, that is, for removing every portion of a tooth, whether whole or in fragments, with the greatest facility to the operator, and with the least pain, or other injury to the patient, we now come to a consideration of the mode of using them so as most effectually to attain these objects.

Sec. 2. *Manner of Using Instruments.*—As a preliminary I will remark, that proper success in extracting teeth depends very much on the manner of the operator. He should, first of all, not only seem to be, but be calm and self-possessed; and this state

is to be attained in two ways; either by the ignorant recklessness of the charlatan, which cannot be too severely reprehended; or by the confidence inspired by a definite knowledge of the parts to be operated on, and which is to be acquired only by study, observation, and experience. Calmness and self-possession in the operator is the readiest and most effectual means of securing the confidence of the patient; and that, especially in all difficult cases, and with nervous, excitable patients—and most patients are apt to be a little *nervous* when about to have a tooth extracted—and with children, is a very important circumstance.

A patient who is excited, or lacks confidence in the operator, is far more likely to be restless, to start suddenly, to jerk about the head, to throw up the hands, and seize those of the operator, and thus break off teeth that otherwise need not and would not be broken, if calm and confident.

Undue anxiety to operate, and to do it quickly, or apparent timidity, or want of confidence in his own skill and ability, excite suspicion and want of confidence on the part of the patient; while, on the other hand, a boisterous, blustering self-assurance may excite disgust; all of which operate sadly against the success and the reputation of the operator.

I cannot here refrain from a few remarks on the

treatment proper to be used toward children when about to be subjected to the operation of having a tooth extracted.

It is common, far too common, under such circumstances, for both operators and friends, and even parents, to deceive children by telling them it will not hurt them to have their teeth extracted, or to tell them to "open their mouths so that the doctor can look at it, and that he is not going to do anything to it, or that he will not touch it, or that he will just put something on it, to make it well," and the like; intended only to gain the confidence of the child, and then, covertly apply the forceps, and extract the tooth before it has time to resist; thus betraying that confidence and deceiving the child! Sooner, by far, would I hold a child by force, and extract its tooth, than thus demoralize it, by teaching it such a lessson of untruthfulness, and so shaking its confidence in the integrity of its friends and of mankind. For myself I never allow any one thus to deceive a child in my presence, on whom I am about to operate, without the rebuke, at least, of at once correcting the impression; and much less would I ever allow myself to commit such an act. Children reason as well as others, and if plainly and honestly told that the operation will hurt, but that it will probably hurt less than is anticipated, and that it is

better even to endure severer pain for a moment, and be done with it, than to suffer for an indefinite time, and then be hurt quite as badly, and perhaps worse, than now, in having it out. Such persuasions, with kindness, will usually secure the consent of the little sufferer and retain his confidence and respect; but, as already remarked, if reasoning and persuasion fail, it is far better to use force than deception.

I will here further premise, that no one ought ever to attempt to extract any tooth, without first making a careful preliminary examination of the case. First, to satisfy himself whether the tooth ought to be extracted.

Patients suffering from toothache are very often deceived in relation to the tooth that causes the pain; and then to extract the one that they might indicate without such examination, would be committing a great fault, and an irreparable injury to the patient. Woful mistakes are, in this way, frequently committed, for which there can be no justification. Patients often fancy, too, since artificial teeth have become so fashionable, that they ought to have even useful teeth taken out, and artificial ones inserted in their stead. This mistake ought not to be made, or at the least, judicious advice should always be given in all such cases.

Secondly, after being satisfied of the necessity of

the operation, the tooth to be extracted should be carefully examined in regard to its strength, its position, the firmness of its attachments, and the probable force that will be required for its removal; the instrument or instruments most appropriate to be used; and the best manner of using them.

These preliminaries having been gone through with, the patient being seated in a slightly reclining position, suppose the tooth requiring extraction to be a superior central incisor, the common straight forceps, of the size and strength suited to the size and strength of the tooth, should be taken (no more instruments ever being displayed than are necessary for the proper performance of the operation in hand); then standing on the right side, and slightly in advance of the patient; the left arm closely surrounding the patient's head, thus giving it a firm support; the palm of the left hand resting on the patient's left cheek, and the fingers opening and protecting the lips; apply the blades of the forceps over the tooth, with their points at the edge of the gum; close them lightly upon the tooth, and then carry them up firmly and decidedly, till their progress is stopped by the edge of the alveolar process; then close them firmly upon the neck of the tooth, and give one or two rotary motions, back and forth, sufficient in force and extent to sever the periosteum,

when a slight tractile force will be sufficient to remove the tooth. As the roots of these teeth are nearly, and sometimes quite round, the rotary motion ruptures their articulating membranes more readily than any other.

I will here remark once for all, that all efforts at extracting this or any other class of teeth, should be made firmly and *deliberately*. All quick or jerking motions produce unnecessary shocks and alarm to the patient, and greatly endanger the breaking of the teeth; especially if they are badly decayed and frail. A good rule in this regard is, never to move the hand faster than its effects can be followed and appreciated by the eye, so that it can at once be stayed, if it is perceived that undue injury is being inflicted, on any of the contiguous parts. "An operation is generally soon enough performed, that is well performed."

For extracting the upper lateral incisors, and indeed for all other teeth in the upper jaw, as well as all the teeth in the lower jaw, when forceps are used, except the incisors, cuspidatus, and bicuspidati on the left side of the lower jaw, the relative position of operator and patient should be essentially the same as for the extraction of the upper central incisors. The same forceps should generally be used, for the lateral as for the central incisors, but selected with

reference to their adaptation to the width of the tooth; and they should be applied in the same manner; but as the roots of these teeth are generally more or less flattened on their "approximal" sides, a motion forward and backward will frequently, if not generally, succeed better in severing their attachments than the rotary.

The cuspidati for their removal require the use of the strongest straight forceps, which are to be applied in the manner already described; but as the roots of these teeth vary very much in their forms, sometimes being quite round and sometimes very much flattened, and as they are also frequently much curved, or even crooked, producing the effect, so far as the motions for extraction are concerned, of very broad roots, the appropriate motions, whether rotary or forward and backward, must depend on these circumstances, and can generally be determined by a careful examination. But when an examination does not determine their form, it must be decided by trial; and in such cases it is perhaps best, usually, to try the rotary motion first, and if that does not succeed, by a reasonable amount of force, then to try the other.

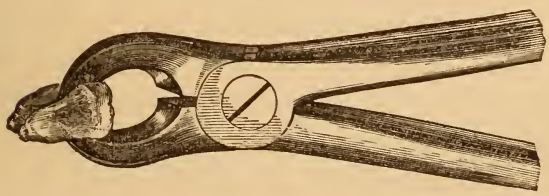
The roots of these teeth usually being both larger and longer than those of the incisors, more force is generally required to remove them.

For extracting the upper bicuspidati, the forceps described as suited to those teeth should be taken, and placed upon the tooth, whether it be in the right or left side of the mouth, with the longest blade of the instrument on the palate side of the tooth, and carried well up, quite to the alveolus; and the motions should be very firm, steady, and gradual, first to and from the operator, in the direction across the mouth, and, when the attachments are severed, a tractile force sufficient to remove it from its socket. These teeth, and especially without this care, are more liable to be broken, in attempting to extract them, than any other class, and more particularly the anterior one, which is so frequently divided into two slender roots, which makes its attachments stronger, in proportion to the strength of the tooth, than any other. But one other great reason, and probably the most common one, for their being so frequently broken, is, that the forceps generally in use for extracting these teeth are both too stiff and too much curved, in their blades, so that they do not yield, in the least, to the force applied to them, thus bringing all the power too suddenly upon the tooth, and also to bear too much upon their points, like cutting forceps, or the point of one of the blades acting as a fulcrum over which to break off the tooth by the handles being allowed to rotate upon it till the opposite blade

comes in contact with the crown of the tooth, as noted in the description of this kind of forceps.

In extracting the upper molars, and particularly the first and second, as they have each three roots—two external and one internal—two pairs of forceps are required, one pair for each side of the mouth; the blades of which should be well fitted to the peculiar form of this class of teeth, as already described. They should be applied, like that for the bicuspidati, with the longest blade—the one having the single concave—on the inner or palate side of the tooth. This blade should be forced firmly to the edge of the alveolar process, and the central point of the outer, or double concave blade, should be forced *under* the edge of the process, so that it shall fairly enter the bifurcation of the external roots of the tooth, and

Fig. 36.



the edges of the concavities shall be in apposition with the edge of the process. The motions should then be forward and backward, to rupture the mem-

branes, and then tractile. These teeth being large and so firmly planted, require often a very considerable force for their removal; but with such an instrument so applied there will be no danger of its slipping, or but very little danger of breaking the tooth, or of failure of success.

For the wisdom teeth in this jaw, the forceps should be applied, as nearly as may be, in the same manner, and with great care; but, from the size of these teeth, a smaller pair of forceps than the common molar usually answer best. (I generally use my children's forceps for these teeth.) As the roots of these teeth are generally close together, and frequently all united, a small pair of forceps, of the same general form as the ordinary molar forceps, but having each blade with only a single concave, in a majority of cases would be a better instrument.* When these teeth are curved, as they most commonly are, more or less—the face of the crown and the apex of the root both looking toward the cheek—the motion and force required are mostly, if not entirely, from within, or from the palatine side of the tooth outward. The force necessary for their removal is gen-

* I have been latterly using Roberts's upper wisdom tooth forceps. At first sight they seem to be a queer, crooked, awkward kind of instrument; such was my first impression of them; but on trial I have found them most admirably adapted to the purpose for which they are intended.

erally much less than for the preceding, or, indeed, than for any of the other teeth.

The elevator is sometimes used for removing these teeth, and they can generally be very readily removed by it, but in so doing there is great danger of fracturing the pterygoid process of the sphenoid bone. Therefore the use of the elevator cannnot be recommended for the extraction of these teeth.

In extracting most of the teeth from the lower jaw, as already remarked, the position of the parties should be essentially the same as before described, but with these modifications: Instead of the palm of the operator's left hand resting on his patient's left cheek, the palm and last three fingers should firmly grasp the patient's chin, while the forefinger and thumb are to be used to remove and protect the lips and tongue. It will also be more convenient for the operator to be relatively more elevated, in relation to his patient, in operating on this jaw than on the upper, especially in extracting the molar teeth, as he will thus be in a position to exert more force, and to do it more directly. And for this purpose a small movable platform, or stool, of about six inches in height, will be found very convenient.

Having assumed the proper position, if it be either of the incisors, the cuspidati, or the bicuspidati, that is to be extracted, take the instrument already de-

scribed as suited to these teeth, place it upon the tooth with its longest or upper blade on its inner or lingual side, force both blades down firmly upon the edges of the alveolar process, and then with an inward and outward and an upward motion the tooth is usually readily removed.

In extracting the lower molar teeth from the right side of the mouth, the longer or *upper* blade of the forceps (lower molar forceps) should be placed on the side of the tooth next to the tongue, care being used so to place them, and to force them down, that when closed their points shall fairly enter the bifurcation of the roots of the tooth; then with a firm, steady motion forward and backward, *across the mouth*, and proper tractile force, the tooth is usually with certainty removed. Sometimes, from the nature of the

FIG. 37.

case, this class of teeth require a great deal of force for their removal, as where the roots at first diverge considerably, and afterward converge, till their points

come in contact, inclosing, as they must, an amount of the alveolus which acts to all intents like a rivet, to hold the tooth in its socket, and which must necessarily be broken and brought away between the roots, or one or both of the roots must be broken. So, too, when the roots of such a tooth diverge in their whole length, till they are wider across their points than at the neck; they not only require a great deal of force to start them from their sockets, but it must frequently be continued till their very points have left them. In such cases the roots must spring enough to clear them, or one of them must break. Such an accident, in such a case, is unavoidable, and should bring no reproach upon the operator.

In extracting the lower molars from the left side of the mouth, the same instrument is used as for those on the right side, but the shorter or *lower* blade must then be placed on the inner side of the tooth, which necessarily brings a large portion of the instrument within the mouth. After it is applied, so that the points of the forceps fairly enter the bifurcation of the roots, the force is to be applied in the same manner as on the other side. The great advantages of using but one pair of forceps, for both sides of the mouth, in extracting these teeth are, that by standing on the right side of his patient, the operator is in a much more favorable position to exert the nec-

essary force; and he has also the full control of his patient's head, which he holds firmly and steadily by encircling it with his left arm, which he cannot do if he stands in front of his patient, as he is obliged to do if he uses the right and left hand forceps.

In extracting the incisors or cuspidati, and bicuspidati of the left side of the lower jaw, it becomes necessary to stand as near directly in front of the patient as may be; the chin of the patient grasped firmly with the operator's left hand, the fingers all being under the chin, while the thumb is within the mouth, and resting on the patient's other teeth. The instrument is then to be applied, and the force exerted in the same manner as in extracting the teeth on the other side; that is to say, the blades must first be carried quite to the alveolus, and the movements of the instrument inward and outward.

The roots of all the lower teeth are so much compressed or flattened laterally, that they do not admit of the rotary motion for their removal; neither does the form of a suitable instrument readily admit of that kind of motion. The same remark may also be made in relation to the roots of the bicuspidati of the upper jaw.

It will be observed that in my directions for the application of forceps, I have frequently repeated that they should be carried quite to, or even under

the edge of the alveolar process. This I have done of design. I wish to impress the direction emphatically; for where a tooth is seized by its crown, or just at the base of the crown, instead of at its neck, it is almost sure to be broken, and not extracted. This should ever be borne in mind, and never be forgotten, whenever forceps are used, or in fact any other instrument.

The wisdom teeth in the lower jaw are almost, if not quite, without exception, more or less curved or hook-shaped, thus forming nearly the segment of a circle, larger or smaller; or sometimes the root stands at an angle little if any less than a right angle to its crown, and its apex or foramen always looking backward, or toward the ramus of the jaw. The crown of the tooth is short, and its neck very short. The tooth being in the posterior part of the mouth, the space between the jaws is frequently so small that it is difficult on that account fairly, or in any way conveniently to grasp it with the forceps, which difficulty is also increased by its being so far from the front of the mouth; and if grasped, from its position, it is difficult to bring the handles of the forceps into such a position as to act upon the tooth with any force without injuring the mouth with them. The jaw is here wide and flat on its top, with almost no alveolar process, so that the points of the forceps can

but rarely, if ever, be inserted into the bifurcation of the roots of the tooth,—if indeed the roots are bifurcated, and in a very large share of them they are not,—but can at most only seize the tooth on the two sharp points of the instrument (if the common forceps are used, and with any forceps), just at the base of its crown, where but a slight force is sure to break it off without removing its roots. It will readily be perceived by examination, that the shape and position of these teeth are such, that if the forceps could be ever so well applied, it would be almost impossible with them to exert a force in the direction necessary to remove them easily; that is, in the direction of the axis of the tooth, as from their being placed so far back in the mouth, the force of the forceps must almost necessarily be forward and outward or sidewise, one which must make the crown of the tooth operated on only impinge the more strongly against the crown of the second molar (if that tooth is still in its place), and the curved or hooked root incline to burst up the bone posterior to and above it, or if that be too strong to yield, to break the tooth; whereas the force should be, readily to effect the object desired, directly upward and *backward*. Therefore, in removing this class of teeth, if the second molar is still in its place, I always use the straight elevator (modified as described) by in-

serting its point firmly between the neck of the tooth to be removed and that of the second molar, using that and the alveolus as a fulcrum over which to pry out the tooth. This, it is plain to see, exerts a force in the exact direction most directly to overcome all resistance; or in other words, in that direction that meets the least resistance, and that requires the least possible force to effect its removal.

With this instrument, too, a lower wisdom tooth can quite readily be removed, when from abscess or other cause, the face is swelled, and the jaws closed to any extent short of absolute occlusion; and I know of no other instrument that will effect the same result under such circumstances.

The position to be assumed when using this instrument, for extracting these teeth on the left side, should be the same as in using the forceps in extracting the left lower incisors. On the right side, the same as for using the forceps on that side.

If the second molar has already been removed, the straight elevator cannot be used, there being nothing left for a fulcrum over which to use it. But in such cases the other kind of elevator may sometimes be used with good effect, treating the tooth as if it were simply a root. The forceps, too, can better be applied and used now, than when the second molar

was in its place. But the means must be adapted to the emergencies of the case.

As, in describing our instruments and the purposes to which they are applied, we have already, and almost necessarily, described the method of extracting the roots of teeth whose crowns are gone, and as we shall have need to refer to that subject again to some extent when treating of accidents which are liable to occur in the operation of extraction, nothing further need be here said on this subject.

With the necessary anatomical knowledge, and sufficient experience to acquire self-confidence, with the instruments here described, and those instruments used as here directed, but little difficulty need ever be apprehended in the extraction of almost any tooth. True, some extraordinary cases will require extraordinary means, for which the operator must, to a great extent, rely on his own judgment, guided by the exigencies of the case.

CHAPTER V.

OF LANCING THE GUMS.

"LANCING the gums," in some cases of extraction, is a very important preliminary operation, and, when required, it should be done well and thoroughly. A description of the manner of doing it has already been incidentally given, when explaining the method of extracting the teeth, or rather, the crownless roots of teeth, which require it; to wit, the roots of such teeth as are broken off so far below the gum and edge of the alveolus, that they cannot be seized or apprehended by the instrument to be used for their removal, without either cutting or injuring the gums; or such roots of teeth as, from inflammation or otherwise, have the surrounding gums more or less closed over them, rendering it difficult to apply any instrument without first removing the gum, or at least not without inflicting a great deal more pain, with the extracting instrument, than with the knife. The manner, and the amount of cutting, will, of course, depend on the circumstances of the case. If it be a firm root, bro-

ken low, so that to remove it, it is necessary to remove a portion of the alveolus, the gum should be dissected by one or two strokes of the knife from the alveolus, as deep as the forceps are to be applied, and as wide as is necessary to facilitate their application; another cut should also be made by a single stroke of the knife in the direction of the length of the root, forming two small flaps of the dissected gum. The same operation should be performed on both the inner and outer sides of the root if forceps are to be used; but if the case is one where the elevator is to be used, it will only be necessary to make the cuts on the outside, and usually in but one direction.

In performing the operation, any of the curious and even complicated lancets on which so much exuberant ingenuity and skill have been expended, can perhaps, with care, be made to answer the purpose as well, or nearly as well, as a simpler and more convenient one; and a plain bistoury or a scalpel, or a common penknife, will answer just as well.

Although, as I have said, this operation is sometimes necessary, and, in some cases, quite important, yet, as a general rule, it ought to be entirely omitted; and for various reasons. The first of which is, that in all ordinary cases, and with but *very* rare exceptions—that is to say, in the extraction of all

entire teeth and most roots of teeth—it is entirely useless.

The resistance to be overcome, in extracting most teeth, is offered chiefly by the strength of the firm, dense membrane uniting their roots to their alveoli. It is therefore very evident that simply severing the gum from the neck of the tooth, to which it is usually not strongly attached, and all of it that can be reached by any ordinary gum-lancet being of but small extent, can have but little influence in lessening the amount of force that it would require to extract them. A knife or gum-lancet of any kind, cannot, by any possibility, be carried far enough between the tooth and its alveolar process, to sever but a very small portion of the periosteum ; and it is very seldom that any one ever attempts to cut this membrane below the edge of the alveolus, unless it may be in the case of some loosened root which he intends to remove entirely with his knife.

The next great source of resistance in this operation, and sometimes—not unfrequently—the source of greatest resistance, is the divergence or convergence of their roots ; or the divergence of them for a portion of their length and their convergence the balance, requiring, if one or more of the roots do not first break, the removal of the bony septum between their roots, or the yielding of the parietes of the alve-

olar cells, or the springing of one or more of the roots, to admit of their removal, even if the periosteum were all scraped or macerated away.

Corrugations in the roots, or crooks in them, exert a similar influence which no knife or lancet, however ingenious its form, can overcome.

As already remarked, the attachment of the gum to the neck of a tooth is always slight, and the extent inconsiderable; so slight and so inconsiderable, that no operator or patient could possibly appreciate the difference in the amount of force required, or the pain experienced, whether the gums were cut or not. And besides this, the lancet in almost all cases is rendered entirely unnecessary by the fact that properly constructed forceps—forceps fitted to each class of teeth on which they are to be applied, as described in the preceding chapter—will more easily and more thoroughly do it, and by the same movement that applies them to the tooth, than any lancet can be made to do it; and with no more pain, if even as much, in the application, than if the gum had been ever so freely lanced before.

The operation of lancing the gum preliminary to extracting a tooth is, in most cases, not only unnecessary, but decidedly objectionable for many reasons.

It produces a great deal of unnecessary pain. With many patients, the dread of having the gums lanced

is greater than that of having the tooth extracted. Many timid and nervous patients can, by great effort, bring themselves to bear the infliction of one pain, but cannot a second. So, it is no uncommon thing for such a one to submit to having a gum lanced, and then to go away without having the tooth extracted; but who would gladly have had it out, if it could have been done at once; *as it should have been.*

There is also *some* more danger from excessive hemorrhage when the gums are lanced than when they are not. A smoothly cut surface is more liable to bleed than a lacerated one. Therefore, in all cases, when it is necessary to extract a tooth, where a *hemorrhagic diathesis* is known to exist, or is mistrusted, the use of the lancet should be most sedulously avoided. I once knew a child to bleed to death, in the hands of a very able surgeon, from simply cutting the child's gums to facilitate the eruption of its upper deciduous central incisors, though all known means were resorted to to arrest the bleeding, from simple and long-continued pressure, through all the range of styptics and astringents, from cold water to the actual cautery.

The only argument known to me in favor of the general use of the lancet is, that by the adhesion of the gum to the neck of the tooth, sometimes the gum may be lacerated before that adhesion yields. If

this were the usual result of neglecting to use the lancet, or if it were even a frequent occurrence, in consequence of such neglect, there would be force in the argument. But as that accident, in my experience and observation, does not occur more than once in some thousands of times, and even then is the result of other carelessness—the good rule not being observed of operating no faster than the eye can follow, or than the hand can be stayed at any stage of the operation, and, as already demonstrated, the forceps accomplish the object more effectually, without loss of time to the operator, with less pain, and without the interval of terrible suspense to the patient; therefore, on the principle of "the greatest good to the greatest number," I cannot think it justifiable to torture the great multitude, in order to save an individual, or even a few persons, from the possibly unnecessary slight infliction of pain that might thereby have been avoided.

Have a gum-lancet, then; let it be a good, plain, practicable instrument, but use it seldom.

CHAPTER VI.

ACCIDENTS ATTENDANT UPON THE EXTRACTION OF TEETH, AND THEIR REMEDIES.

Sec. 1. Although with the present improved styles and new kinds of extracting instruments, and the improved manner of using them, accidents from this operation are much less frequent than formerly, still they will sometimes occur, even with the best informed and in the most skilful and careful hands, and frequently from no want of care or precaution on the part of the operator.

These accidents may occur from undue excitement and uncontrollable restlessness on the part of the patient; from malformation or mal-arrangement of the teeth; from some peculiar temporary condition, or from some inherent vice in the constitution of the patient; and sometimes they may occur from carelessness.

Among the most serious of these casualties, though fortunately far from being the most frequent, is excessive hemorrhage.

This, though sometimes the result of other causes,

as the accidental fracture of the alveolus, by which the dental artery may have been wounded, or by an extensive laceration of the gums, is more commonly dependent on some morbid state of the system, temporarily changing the character of the blood, so that coagulation does not readily occur; or producing such relaxation as to overcome the contractile power of the bloodvessels; or it may depend upon a *constitutional* hemorrhagic diathesis,—circumstances that cannot always be foreseen, or if foreseen, are not always within the control of the operator.

If a hemorrhagic diathesis is known to exist in the patient, *or in any of his family*, and an operation becomes imperative, the utmost care should be used to avoid all incisions, lacerations, or other wounds that are not absolutely unavoidable, and especially in such cases should the use of the lancet be avoided. "A clean cut bleeds more freely than a lacerated wound."

Dr. Taft, in his "Operative Dentistry," page 356, relates a case of a patient who very nearly lost his life by hemorrhage, from simply lancing his gums, preparatory to extracting a tooth, which he finally refused to have extracted. And I have already referred to a case which came under my own observation, of an infant which bled to death from only a comparatively slight incision of its gums.

If there be good cause to apprehend excessive bleeding from an enfeebled condition of the system, or from any other cause, and the nature of the case will admit of delay, a proper course of tonic treatment, would, no doubt, be but a prudent precaution before proceeding to operate. But, unfortunately, in most cases, the liability to this accident cannot be foretold nor foreseen, therefore, when it does occur, our only recourse is to make the best reparation in our power, by taking advantage of all favorable circumstances, and by availing ourselves of the best means known for arresting the flow of blood.

The most common recourse in such cases is the application of cold water, or of some of the various astringents and styptics, or of compresses, or a combination of some or of all of these agents.

Of the styptics and astringents, which have been extensively used in such cases, and with varying success, the most common and effectual are tincture of nut-galls, powdered nut-galls, tannic acid, gallic acid, tincture of matico, the leaf of the matico rolled and inserted, oil of turpentine, nitrate of silver, spiders' web, and perchloride of iron, persulphate of iron, and some have resorted to the actual cautery, but that, I think, is always an operation of doubtful expediency. From my own observations of this searing process, which, however, has not been very

extensive, its only effect is to form a crust or scab on the surface, which may temporarily arrest the flow of blood, but without any tendency to the formation of clot in the blood, or any permanent contraction of the vessels, and which is generally soon forced off by the action of the blood, leaving a larger bleeding surface than before, to be treated by other means. The milder means are generally more effective, and the after consequences far less serious. Sometimes, when the bleeding is quite persistent and very considerable, simply rinsing the mouth with a pretty strong solution of tannin, or of powdered nut-galls, is sufficient to arrest the bleeding, especially if it proceeds from the capillary vessels; but a more effectual way is to saturate pledgets of lint or of cotton in a solution or tincture of these substances, and having first cleared the sockets from which the tooth has been removed, as well as may be, of all clots and blood, thrust them to the bottom of the bleeding cells with a probe, or other convenient instrument, and so keep on, adding pledget after pledget, till the cell is full. When matico or turpentine is used it should be done in the same manner. Sometimes it may be more convenient to use the tannin or galls in powder than in solution or tincture; then the pledgets may be moistened in cold water, and rolled in the powder until it has taken up all it

will contain, when the pledgets are to be packed into the bleeding cells as before described. When nitrate of silver is used, the most effectual way is to powder the salt and apply in that manner.

If thus packing the cells does not prove sufficient, a few folds of lint or of common muslin may be placed above it, and over all place a metallic plate with clasps, or a bit of wire twisted together, so that its

Fig. 38.

ends may form clasps to attach it to the adjoining teeth; but for the want of such conveniences, or if there are no teeth adjoining, a cork may be cut, so as to leave one end of it the shape of the letter V, and placed over the compress and retained in place, and made to produce pressure by closing the jaws upon it, and keeping them closed, by passing a bandage over the head and under the chin; or the same thing may be effected by placing enough folds of the muslin above the bleeding part to meet the teeth or gums of the opposing jaw, when the mouth is to be closed, and the bandage applied as before described. When the pressure can be sustained by clasping to other teeth, it is to be preferred to bandaging, as it is much more comfortable to the patient, as this leaves the jaws entirely unrestrained.

When such means are necessary as the bandaging together of the jaws, or the use of metallic plates or wires to produce pressure, they should be allowed to remain, and to sustain a steady pressure for several hours after the bleeding has ceased, and the pledgets with which the sockets have been filled, and more especially if there be a distinctly marked hemorrhagic diathesis, should be allowed to remain till the process of suppuration and granulation has removed, or at least loosened them; and when removed, it should be done with great care and delicacy.

If the case be urgent, and the above-named remedies are not at hand, or do not effect the desired result, there is another article which is almost everywhere to be found, which may be tried, and which in my hands once answered a most admirable purpose. This article is the common spider's web, or "cobweb." The only objection or inconvenience that I know of to the use of this article is, that my patient complained of pretty severe temporary pain from its application. In illustration of its effects I will relate a case:

On a bitterly cold Saturday evening, in the winter of 1855, at about eight o'clock, a young woman of apparently about twenty years of age, of fully medium height, rather inclined to *embonpoint*, though not decidedly so, of graceful form, with a pleasant

face and manner, and a complexion that, by gaslight, seemed very fair, but which, by daylight, assumed a rather sallow, unhealthy kind of hue, came to my office, accompanied by a friend, and wished me to extract her first right lower molar tooth. After examination, I applied my forceps, and removed it, and with considerably less than the average amount of force required in such cases. She expressed herself delighted at the ease with which I had taken it out, and was about to leave, but noticing that blood was flowing more freely than is usual after the extraction of a tooth, I suggested that she had better wait till the bleeding had ceased. After waiting for a considerable length of time—she rinsing her mouth freely with cold water meanwhile—and, seeing no abatement in the bleeding, I added tannin to the water, but with no effect. I then plugged the alveolar cells with pledgets of cotton, previously moistened and rolled in tannin. This seemed to check the bleeding for a very short time, but did not entirely stop it even for a moment. I next applied pledgets of cotton, saturated with oil of turpentine, and after that with tincture of matico, but each with no more favorable result. I then resorted to nitrate of silver, which I applied by moistening pledgets of cotton and rolling them in the pulverized salt until they had taken up all they would contain, and with them

firmly plugged the cells. To my great delight, after this application, the bleeding stopped, and my patient left my office about an hour and a half after the tooth was extracted.

While she was in my office I learned from her and her female friend who accompanied her there, and from others subsequently, that she was stopping with an irregular medical practitioner, for the purpose of being with and nursing a younger brother, who was there to be treated for some scrofulous affection, and to be herself treated for leucorrhœa, or some other uterine difficulty, and was at the same time acting as a kind of sub-housekeeper for her medical adviser, a female physician.

The next day, passing the doctress's(?) office, and feeling a great deal of anxiety about my patient of the night before, I called to inquire about her, and was told that my application had only restrained the hemorrhage for a few hours, and that she (the *madam doctor*) had stopped it by the application of "the scrapings of sole-leather." Although I could not readily understand why the comparatively little tannin contained in the leather should have so much more effect than the pure tannin, which I had used, I was very glad to learn that the bleeding had been stopped, and by any means or by any hands.

On the Tuesday afternoon following a messenger

came, desiring me to come and see my patient as soon as possible, saying that she was again bleeding badly.

Having already tried most of the well-known powerful styptics in her case (the perchloride of iron had not then been brought into notice), and knowing that the "cobweb" had a very general popular reputation for arresting hemorrhage, I provided myself with that article before going to see my patient; whom, when I went, I found lying in bed, with her head over its side, and bleeding badly; and she said she believed she was bleeding to death, and in that opinion there seemed grave reasons for concurring.

First of all I directed her to assume a position as near erect as possible consistent with a sitting posture. I then cleansed out the alveolar cells as well as I could, and plugged them with the cobweb; and to my great gratification, found the bleeding was stopped by it immediately.

On examining my patient, I found all her extremities almost deathly cold, her face flushed, and her head hot. I ordered a hot pediluvium, to which, should be added a large quantity of ground mustard, and waited to see the faithful administration of it, and that her feet were afterwards thoroughly rubbed and dried with coarse towels, thus doing all I could to equalize her circulation. I then directed her to

take care to keep her extremities warm; to keep herself quiet; to avoid all excitement and exertion (that morning she had been exerting herself unusually in her domestic affairs); and to send to me immediately on any recurrence of the bleeding.

I did not see her again, but had a message some days after, that she had had no return of the hemorrhage.

From my success in that case, I would most strongly recommend—as strongly as I could from the experience of any single case—a trial of the cobweb in any case of intractable alveolar hemorrhage. It is always and everywhere attainable, and easy of application; and although at the time of my trying it I was not aware that it had been used in such cases, I have since learned that others have used it with marked success in similar cases, after having failed with all other available remedies.

The only other case of alveolar hemorrhage that has ever given me any great degree of anxiety, out of a great many that have required some treatment to arrest an undue flow of blood, occurred in the autumn of 1847. This, also, I will relate, in explanation of the general plan and effect of treatment in such cases. The patient was a man of about twenty-eight or thirty years of age, about medium height; of rather a spare habit; of active movements, and

what, by phrenologists, would probably be called a nervous temperament, and by occupation a book-binder.

The operation was the extraction of the root of a lower bicuspid. It was broken, or rather decayed away, quite to the gum, but still very firm in its socket, and it gave me some trouble to remove it; but I succeeded finally, and very much to the satisfaction of my patient, and without any material laceration or injury to the gums; neither was there any unusual degree of bleeding, either in time or quantity; but, about six days afterwards, he returned to me bleeding most profusely, and said that he had been so bleeding for four or five hours. I cleaned out the socket, from whence the root had been removed, and plugged it with pledgets of cotton, previously moistened with water and rolled in pulverized nut-galls, over which I placed a silver plate, confined to its place by clasping the contiguous teeth; thereby securing steady and constant pressure. This arrested the bleeding for the time, and my patient went away, but in a few hours he returned bleeding as profusely as before. I then substituted pulverized nitrate of silver for the galls, and applied my compress as before, and with more satisfactory results, for it stopped the bleeding for the time, and in an hour or two afterwards I saw him on a stage-coach, having started

with his family to visit some friends in the country. As there was still a very slight oozing of blood, I felt considerable apprehension at seeing him go away from my immediate reach, but as I thought the change of air might be of service to him, and as I did not wish unnecessarily to alarm either him or his family, by expressing my fears, I thought it not best to oppose his going. On his return, two or three weeks afterwards, he told me that the blood continued to ooze a little for an hour or two and then ceased; after which he had no further trouble from it.

Although the local treatment here indicated will claim our first, and perhaps chief attention, the state of the circulation and the general condition of the system must not be overlooked. In some cases, our hope of success must greatly depend on equalizing the circulation, and in such internal remedies as are known to give tenacity to the system, to increase the fibrine of the blood, and restore its quality of coagulation.

Sec. 2. Breaking the tooth is one of the most common accidents attendant upon attempting to extract it.

This may depend upon many circumstances, and may occur in any part of the tooth. With the use

of the key this is a very common occurrence, and then occurs most commonly at their necks. In such cases the most certain way of avoiding this occurrence is by avoiding the use of the key!

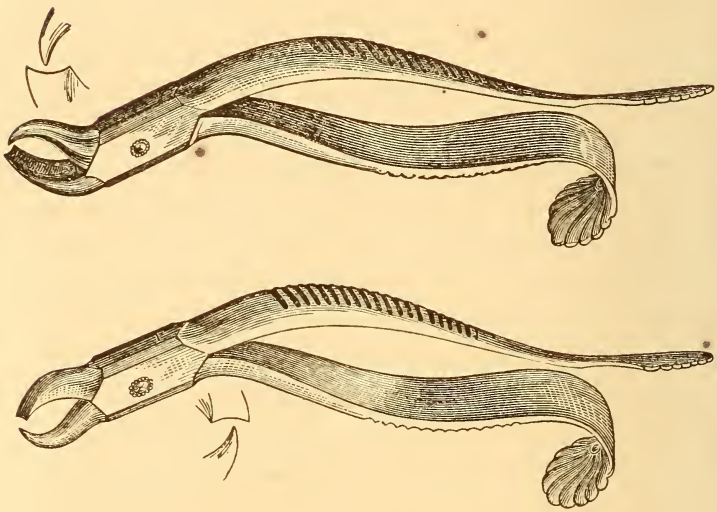
In using the forceps, too, it may occur at that point; but when it does, it is, most commonly, by the use of a badly constructed, or by the bad application of a good instrument; as explained when describing the proper application and use of the forceps. But again, this accident may occur with the best instruments, and in the most skilful hands, as when the tooth is so much decayed, or from other causes is so frail or brittle, as not to be able to sustain the pressure of the instrument required for its removal; or the patient may suddenly seize the hand of the operator, and partially displace the forceps, or exert a force upon it beyond what is required, thus crushing it, or by exerting a force in a wrong direction, and beyond the control of the operator.

The roots of some teeth are so much curved, either outward or inward, as already noticed, or sometimes forming absolute hooks, that they cannot be removed entire, without, at the same time, removing a portion of the alveolar process; but in such cases the root is more likely to break than the process to give way. And as the crown of a tooth does not indicate the form of its roots, we can take no

extra precautionary means to avoid the accident, and, even if they did ever so clearly indicate their form, we should be no better off.

When this accident occurs, the proper after-treatment will depend very much on the condition of the tooth, and the place of the fracture.

Fig. 39.



If the periosteum of the roots of such a tooth is inflamed, or if they are the cause of abscess, the most strenuous and persevering efforts, if necessary, should be resorted to for their entire removal. And the forceps for excising the alveolus, the elevator,

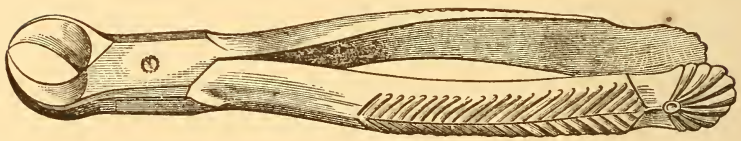
or the gouge, may be resorted to, as the case may require.

If the tooth be an upper molar, broken at its neck so that its roots are left attached together, the gum should be dissected from the alveolus sufficiently to allow the forceps to be readily applied a line or two above the edge of the process, which, with forceps such as described, will usually afford sufficient hold to remove them. But if the common molar forceps cannot be made to effect the object, another kind of forceps, with its external blade somewhat more extended, more curved, and more attenuated, in short, constituting a simple hook, to be applied somewhat higher up in the bifurcation of the buccal roots, while its inner blade is like that of the common forceps, which is to be applied either to the palatine root or over the alveolus, will sometimes be found very useful. This, however, need but very rarely be resorted to, if the regular molar forceps are constructed as described.

If a lower molar is broken above the bifurcation, the common lower molar forceps (having sharp curved points as described) should be applied, with their points on a line with the separation of the roots outside of the alveolus, taking care first to dissect away the gum on both sides, so as to avoid lacerating or otherwise injuring it; closing the forceps

through the alveolus, and thus firmly seizing the roots and bringing away a small portion of the process with them. Sometimes, when the roots are very firmly set in the jaw, and there are indications that they cannot be brought away together, without injury to the jaw, it may be advisable to use the splitting forceps to separate them, when they may be brought

Fig. 40.



away singly, either with the elevator, or the forceps which cut the alveolus and seize the root. Sometimes they will be so much loosened in the act of splitting them apart, that they can be very readily picked away with lower root forceps.

If the broken tooth be a single-rooted one, and it cannot be removed by the elevator, then the forceps for cutting the alveolus should be used. Lower molars broken below their bifurcation, should be treated in the same manner.

If the root of the tooth be broken and is sound and healthy, and not already loosened, and not more than three-fourths of its length remain in the jaw, and sometimes if even more than that remain, my

practice is to let it remain; knowing that before it is likely to produce further trouble, its hooked point will have been absorbed, the alveolus also so much absorbed, and the whole root so far thrown up in its socket, by that process of nature which always strives to relieve herself of all useless or effete parts, that it can readily be apprehended and removed, by the elevator or the root forceps, and with comparatively little pain to the patient or trouble to myself. But in such cases I am always careful to explain the circumstances to my patient, that he shall have no occasion afterward to tell me, or others, that I deceived him.

It is a fortunate circumstance, too, that sound and healthy roots are much more liable to be broken and left in the jaw than diseased ones; and from the fact that if abscess or inflammation have supervened, the bony socket has already, to some extent, at least, given place to the accumulation of pus, or to the thickened membrane, and thus left the root more or less loosened in its sockets.

Sec. 3. Laceration of the gums, with such bruises as sometimes produce severe inflammation, and even sloughing, is by no means a very uncommon accident where the turn-key is in general use. To avoid its

frequent occurrence, as well as the occurrence of many other accidents, avoid the use of the key.

This accident rarely occurs, when forceps are used, except where the alveolar process, by being very thin, and very strongly attached to the tooth, is broken and brought away in the operation. In such cases, by the attachment of the gum to the alveolus, unless great care is used, pretty severe wounds may be inflicted. But the ordinary lancing of the gum is no safeguard against its occurrence. In some *very rare* cases, too, the gum may be so strongly attached to the neck of the tooth, at the back part of the wisdom tooth, where the forceps or whatever other instrument is used, cannot come in contact with it to effect its separation, as to produce slight laceration before the attachment yields.

The proper way to avoid this accident, in either case, is carefully to watch the operation, and never to operate so rapidly, or so roughly, as not to be able to stop before any serious injury has been inflicted. Thus, when the tooth has been started from its socket, and it is perceived that the alveolus is broken, and does not readily part from the gum, or if the gum adheres to the neck of the tooth, suspend its removal, and dissect away the gum from the bone, or from the tooth when the operation can be concluded without injury.

I have oftener seen a strip of gum torn up, and even for a considerable distance across the roof of the mouth, in attempting to extract the root of a tooth with root forceps, whose points, when closed, nearly or quite touched each other, and after the gums had been lanced, in the blood mistaking the edge of the gum for the root, seizing upon it, and pulling away suddenly, and thus tearing the gum, than by any adhesion to the neck of the tooth! Due care will, of course, avoid such an accident as that.

If by any means the gum is unfortunately torn, so as to leave any loose flaps or shreds, they should be carefully cut away; and for this purpose scissors are generally most convenient.

Further treatment, beyond simply rinsing the mouth freely with cold water, if it feel hot and uncomfortable, will rarely be necessary, unless there happen to be a predisposition to hemorrhage, or to inflammation, when it may prove troublesome, like any other wound; and will require to be treated by general principles, modified by the existing circumstances.

Sec. 4. *Fracture of the Alveolus.*—This accident, too, at least to such an extent as to be of any considerable consequence, most frequently occurs from the use of the key; and therefore requires us again unwillingly to speak of that instrument of torture,

which, if we did not know was still very extensively in use, not only in the country, but in the cities, and even by dentists as well as by physicians, we would not so much as once have alluded to it.

Not unfrequently, with this instrument, where the fulcrum is allowed to rest too low upon the gum, or too high, according as the case may be in the lower or the upper jaw, the side of the alveolar process is wrenched away to the extent of the width of the tooth, and the whole length of its roots, and sometimes to the extent of several teeth, thus depriving them of their support, and ultimately involving their loss, and the direct and permanent disfiguration of the sufferer. To avoid such accidents, I must say again, avoid the use of the key.

It is true that this accident may, and even must to a limited extent occur, by the use of the best and most carefully used forceps; but never to anything like the extent that is common in the use of the key. For example, in the removal of a tooth whose roots converge so as to inclose the septum of bone between them, this portion of bone must come away with the tooth, that is, if the tooth comes away entire; but this, except as it sometimes requires a great deal of force to remove a tooth so situated, is of no consequence, and is hardly entitled to the designation of an accident. So, too, if the roots of a tooth are so

greatly divergent that they cannot otherwise be drawn, a portion of the alveolar process may be cracked and forced away, or may be broken and brought away with the tooth. And sometimes, a very long single root, especially if it happen to be crooked, or of an uneven or corrugated surface, and its alveolus chance to be unusually thin, as is the case sometimes with the upper canine teeth, and more frequently than with any other class, in which cases the periosteal attachment may prove stronger than the alveolus, and a portion of it, and *sometimes* a pretty large portion of it, may be brought away. In such cases, however, the fault is not in the instrument, or necessarily in its application, or manner of using, but in the circumstances of the case. Then, if an accident so occurs, we can only do our best to retrieve and to excuse it.

Although the operator may know that such an accident may not be of the least consequence, and sometimes even an advantage rather than an injury, it is not always easy to convince his patient of that fact; and as such occurrences, however trivial they may be, are very apt to create distrust in the mind of the patient, as to the skill and ability of the operator, and sometimes even to affect his standing and usefulness, when it can be done by quietly cleaving the fragment of bone from the tooth, and putting it

aside, it is perfectly justifiable and right for him to keep the knowledge of the fact to himself. This is at least safer for his reputation than to make a display of the case, to show the great difficulties he has had to overcome.

Although I would observe a judicious caution in such cases, I would not compromise my conscience by a denial of the fact if directly asked the question whether the bone was broken, but would frankly admit the fact, taking care at the same time not to make it appear worse than the nature of the case required, if no, or but little injury were likely to result; but, on the other hand, if trouble were likely to result from the accident, I would at once, whether asked or not, tell what had happened, and what results might be expected. When the alveolus has been fractured, whether much or little, and there are any loose fragments remaining, they should be carefully removed; and if there are any sharp projecting points left, they should be removed with the cutting forceps, or some other convenient instrument; otherwise they will be liable to produce irritation and inflammation of the gums.

This, in ordinary cases, is all the treatment that will be required; but severer cases, if they occur, must be treated according to the general principles of surgery.

I have very recently known of quite an extensive fracture of the alveolus, including a considerable portion of the superior maxillary bone, in the hands of a young operator, by the use of the elevator,—the kind of elevator intended for the removal of roots. The case, as described to me, was this. A lady of about thirty years old had had bad teeth for many years. The crowns of nearly all her upper teeth were gone, while the roots still remained. Some of them had been the cause of alveolar abscesses. The gums were in a very unhealthy condition from chronic inflammation and tumefaction. She had determined to have them all removed and to have artificial ones inserted in their place, and went to her dentist for that purpose. He had, without difficulty, removed some of them, when, coming to the roots of the second right upper molar, he attempted to remove them also, with his elevator. To his surprise, he presently found that the decay had not proceeded quite far enough to separate the roots, and that he had, without the use of very much force, loosened them all, and with them a large portion of the alveolar processes; but although these were loose, he could not remove them. Finally, with much embarrassment and anxiety, on both his part and his patient's, he dissected away the gum, on both sides, and removed the mass, which proved to be the roots of the tooth,

a portion of the alveolus about half an inch in length, including both walls and their septa, and enough of that portion of the maxillary bone which forms the floor of the antrum maxillare to make a very distinct opening into that sinus.

A few days afterward the parts thus removed were shown to me. On examination, it was evident that a considerable portion of the outer wall of the alveolus had been removed by the effect of abscess, and necrosis had taken place in that wall and in the septa, and had extended nearly through a portion of the inner wall or plate, leaving but a very thin portion of sound bone.

This accident, though quite formidable in appearance, and very embarrassing to so young an operator, was of no serious importance, and would most likely have occurred in the hands of any one, and by the use of any kind of an instrument. The wound healed kindly and well.

As apropos to the foregoing case, I was once called on by a physician to go with him and extract a troublesome tooth for one of his patients, who was suffering from a long lingering consumption.

We found the patient in bed; his whole mouth in a very bad condition. After examining the offending tooth, I grasped it with my forceps, and with a very small degree of force removed, not only that

tooth—an upper molar—but also the one next back of it, and the entire alveoli belonging to both. On examination I found the bone necrosed and about as brittle and friable as so much dry hemlock bark.

This accident, the fracture of the alveolar process, is by patients most commonly denominated "breaking of the jaw," a term that sounds quite formidable; and true, fracture of the jaw really is quite a formidable accident, but it is one that I have never known to occur in extracting or in attempting to extract a tooth, but in one instance. That case I will here relate.

Sec. 5. *Fracture of the Jaw from Extracting a Tooth.*—In the year 1845, Mr. L., living near Columbus, Ohio, sent his son, a boy of about eight years of age, to that city, to have his first permanent right lower molar tooth extracted. He went to some one practising there as a dentist, and submitted himself to the operation. What kind of an instrument was used I do not know, or in what manner the accident occurred—I should, perhaps, the rather say, how the crime was committed—I am ignorant; but in extracting the tooth, the operator broke the jaw entirely off, just in front of the tooth extracted. Either from not being aware that he had committed the injury, or from an entire ignorance of what was

necessary to be done to retrieve it, or from want of the courage to own it, he suffered the boy to leave his office with the fracture unreduced, and without informing him or his parents of the injury that had been committed.

The boy returned to his home, with his tooth out, to be sure, but not in a very pleasant plight, for he still suffered severe pain, and soon his face became very much swelled. This, however, was probably supposed to be a natural consequence of the operation, or the result of "taking cold," and did not attract particular attention; or, at most, not enough to induce his parents to have it professionally examined.

About three months after the operation, the father removed to the vicinity of this city, where he had formerly lived, and then brought him to town for examination.

I saw him at that time, though the case was not in my care. Then the face was very much swollen, and there was a large fistulous opening at the place of the fracture, with a discharge of fetid, sanious pus.

The gentleman in whose charge the little patient was, from the great amount of swelling, and not mistrusting that such an injury could have been inflicted, and so neglected, did not at that time dis-

cover the extent of the injury, but supposed it to be a case of very bad fracture of the alveolus. He removed some loose fragments of bone, and recommended some treatment to correct the fetor of the discharge, and, for the rest trusted to time. He saw him occasionally, and directed such treatment as the case seemed to require.

At the end of about three months from his first being brought to town, or about six from the time of the accident, the swelling had considerably subsided; when, on a more critical examination, it was found that the jaw had not only been entirely broken off, but that it was now dead and loose in the flesh! The broken end of it was, therefore, seized with a pair of forceps, where it presented at the fistulous opening, and, with but very slight force, was removed entire, from just in front of the first molar tooth to its free articulation. I was present, too, at this operation.

The wound after this healed kindly, but the now unopposed contraction of the muscles on that side so drew around the chin as to produce great and permanent deformity.

It may be proper further to state here, that a somewhat remarkable, or at least unexpected, feature of this case was, that in about six months from the removal of the dead bone, a new one was formed

in its place; but it extended in a straight line from the place of fracture to the articulation, without any angle. And what was a still more remarkable feature in the case was, that not long after that time, a new tooth was found cutting from this new bone.

Although this is an accident that but very rarely happens, and that ought never to happen, it is well to know that it may happen, because it has happened. And if so unfortunate an occurrence should ever befall any one, he should immediately reduce the fracture, and take the proper means to keep the fractured ends of the bone in perfect apposition; or, if not competent to treat the case himself, he should at once call the aid of a competent surgeon.

Sec. 6. *Extraction of a Wrong Tooth.*—This is an accident of not very frequent occurrence, but still more frequent than it should be, for it occurs not only sometimes unavoidably, and sometimes by mistake, that may be excusable, but sometimes by sheer carelessness, for which there is no justification or excuse.

Sometimes a patient applies to have a perfectly sound and healthy tooth taken out, saying that the pain in it is intolerable, and insists on having it out, when the seat of the pain is in a contiguous tooth, or even in one quite remote from it; or, it may be,

that the origin of the pain is in no way connected with the teeth. One unobservant or unacquainted with the pathology of toothache would, under such circumstances, be very likely to rely on the impressions of his patient, and to be guided by his wishes, and take out the tooth pointed out to him. This, too, would be an inexcusable error, for no one ought ever to pretend to extract teeth, until he can by his own examination, more certainly tell what tooth aches than can his patient.

But sometimes, as for example, it happens that a molar tooth has a small but deep decay near the centre of one of its approximal surfaces, and where, from its position, neither the eye nor an instrument can reach to explore the cavity. In such a case we must mainly rely on the impressions of the patient, and if they are wrong, we shall be liable to take out the wrong tooth. This, when no care on the part of the operator has been omitted, is an excusable mistake.

Again, it sometimes happens that when a molar is to be extracted, the root of a bicuspidatus adjoining it may be partially imbedded in a groove in the root of the molar, and the roots of the molar, by being at the same time considerably divergent, may extend partially under that of the bicuspidatus, when, on

removing the molar, the bicuspidatus is of necessity brought away with it. But as no amount of care could predetermine their relation, and no skill could avoid the result, the operator is not to be blamed; and all that could then reasonably be asked or expected of him would be that he make the best reparation in his power.

This last-named accident has twice occurred in my own practice. In extracting a molar, whose roots were divergent and deeply grooved on their outer approximal surfaces, a bicuspidatus, whose root was partially imbedded in the root of the molar, was brought away with it, and when the instrument was fairly and perfectly placed on the molar, which was so much larger than the other tooth that the instrument did not, and could not in the least, impinge upon, or even touch the smaller tooth.

In such cases, both for the satisfaction of the patient, and to protect the reputation of the operator, the teeth should at once be shown to the patient, and the circumstances explained and illustrated.

But when from any cause, whether justifiable or unjustifiable, a tooth has been taken out that ought not to have been, a very important question arises, to wit: what shall be done with it? To this question different answers have been given. But, from the few cases that I have myself tried, a few that have

come under my observation in the hands of others, and several reports of other well-attested cases, I could feel justified in taking, or in recommending but one course; and that course would be, immediately to replace the tooth as nearly as possible in its original position, and then require the patient to close the jaws firmly, till all the other teeth come fairly in contact; thus assuring myself that the tooth did not stand too prominent, and would not ultimately interfere with the perfect closing of the jaws, or in other words, that it was perfectly in its place.

In almost every case, probably in every case where the circumstances are not particularly unfavorable, where this course is pursued, it will be found that in a few days the tooth has become re-attached by its periosteum to its socket, and as fully restored to usefulness; the only inconvenience experienced, having been some soreness; enough, perhaps, to require the use of such food as would not require much mastication for a portion of the time. I have never yet seen a case of the kind fail; but it is true that the few cases I have seen were favorable cases. But, although in a generally unhealthy state of the mouth or of the system it might fail, and would be more likely to fail than under more favorable circumstances, I would still most strongly recommend a trial of it in all cases; for, in surgery, sometimes what seem to be

very unpromising cases, turn out even unexpectedly well.

Sec. 7. *Dislocation of the Lower Jaw.*—In some persons with very lax muscular and ligamentous fibre, and, especially, if they have large mouths, this is an accident very easily produced. Yawning, only, sometimes produces it, and when it has once occurred it is more likely to re-occur than before; and it probably more frequently happens by the patient suddenly opening the mouth to its fullest capacity to admit of an operation, than by the operation itself.

In the use of forceps, if the chin is firmly grasped by the left hand, as it always should be, the jaw receives such support as to render it almost impossible to dislocate the jaw. In using the key, the chin cannot be thus seized and supported, and if the fulcrum of that instrument be next the tongue, as is the most common way of applying it, a severe strain is made on the articulation of the opposite side of the jaw, which may produce, and often has produced, this accident, which can only be produced by the depression of the chin, thus turning the condyle or condyles, as the luxation may happen to be of one or of both articulations, out of its socket, and lodging it in front and above the glenoid fossæ with which it articulates. The mouth will then be opened to its

fullest extent, the jaw fixed, and the countenance expressive of great anxiety, as illustrated in Fig. 41.

Fig. 41.

From a study of the action of the muscles which close the jaws, it will at once be seen that the force required to reduce the luxation must be directly downward; and when the jaw has been forced down till the condyles are opposite their sockets, the muscles themselves will carry them backward, with a sudden snap, into their proper places.

The necessary force to effect this object can most readily be applied by placing the thumbs on the posterior teeth, or if they are gone, by placing them as far back as may be on the jaw, using them as a fulcrum, while, with the fingers, the chin is forcibly raised.

Some recommend the use of corks or other sub-

stances, placed between the molar teeth as fulcrums, instead of the thumbs, but they require more display, are less readily managed, and are less effective. But when the thumbs are used, it will be but a prudent precaution to wrap them with napkins or any other convenient material, lest in the sudden closure of the jaw they be bruised by the teeth.

In the dislocation of the lower jaw, as in dislocation of all other joints, there must necessarily be more or less straining or even rupture of the capsular ligaments; therefore, till the parts have had time to recover their strength, after such an accident, care must be used to avoid opening the mouth further than is necessary for the reception of *soft* food, lest the accident be reproduced; and to guard against this, it may be well to affix a bandage over the head and under the chin, so as to restrain the motions of the jaw within certain limits.

Such bandaging, too, will be a prudent safeguard in preparing to extract a tooth for one in whom the accident is known previously to have occurred, for, as already remarked, when this accident has once occurred, it is more easily reproduced than before.

Sec. 8. *Syncope, or Fainting.*—With some, syncope seems almost to be a habit, they being subject to it from the slightest causes, and almost all occasions, as from sudden sensations of pain or fear, sorrow or

joy. Some are liable to it under certain conditions of the system, but never otherwise. There are no distinctive indications known to the writer, by which to determine who are liable to it, or under what circumstances. Sometimes, the apparently healthy and strong are very liable to it, while others that are feeble and sickly never faint, and the reverse.

I once saw a healthy, strong, robust and *brave* man faint entirely away, from the slight scarification of the arm in the operation of vaccination.

This accident is quite as likely to occur from the dread of the operation, as from the operation itself. It sometimes occurs simply from a sight of the instruments to be used, and frequently from the sight of blood; therefore no unnecessary display of instruments should ever be made, and what are necessary should always be clean and in good order, ready for immediate use; and no blood should in any way be drawn, if it can be avoided, until the tooth is extracted; and after one operation, all instruments and vessels should be carefully cleansed and freed from all stains or appearance of blood, before another is undertaken.

A rough and unfeeling manner sometimes causes fainting, therefore kindness and gentleness of manner, especially with female patients, should most sedulously be cultivated and observed.

"It" (syncope) "consists in an intermission of the heart's action, and consequently irregularity of the circulation of the blood, accompanied with a temporary suspension of the functions of the brain, and a loss of consciousness." The first indication of its approach, generally, is that the patient complains of nausea, and a ringing in the ears, accompanied with pallor of the countenance, and partial or complete prostration of muscular energy, with irregular or suspended respiration.

The readiest way of restoring a patient from syncope, is to place him in a horizontal position, free from all compression and restraint of the neck, chest, and respiratory organs; admit a full and free supply of fresh air; apply aqua ammoniæ or other volatile stimulants to the nostrils, or dash cold water in the face, with friction of the extremities. Or, what I have frequently found more effective than any other remedy, especially if the patient be not habituated to its use, is to give a teaspoonful or two of brandy with about an equal quantity of cold water. Much more than this, to one accustomed to its use, will be necessary.

Sec. 9. *Hysteria.*—With those subject to this disease, the dread or the shock of this operation is frequently sufficient to develop it. It has occurred

several times in my own practice from the dread of having a tooth extracted, and a few times from alarm at the peculiar sensation produced by the first sensible effects in inhaling ether; and I have seen it from these causes in the hands of others.

The symptoms are various; at different times simulating almost all manner of diseases. Among the most common, however, are a sense of suffocation or choking—the "globus hystericus" of the old writers—apparent syncope, and spasms or cramps of the muscles of the abdomen, chest, neck, and limbs, and especially of the hands and fingers, which are frequently as rigid as if they were frozen; all accompanied with a sensation of great fatigue, which they often express by saying, "I am so tired." This complaint occurs much more frequently with females than with males.

The most effective remedy, usually, is either some anodyne—the most satisfactory of which I have ever tried being small doses of the tincture of assafœtida—or entire neglect. The appearance of the patient, to one who has never before seen the affection, is often truly alarming; but the anxiety and sympathy of friends or attendants almost always aggravate the complaint. Fortunately the prognosis is nearly always favorable, and time and proper *neglect* will generally at least afford relief.

CHAPTER VII.

ANÆSTHETICS.

A WORK of this kind, at the present day, might seem to be incomplete without something being said on anæsthetics. But on this subject I have but little to say.

In all serious surgical operations, and especially where "the shock of the operation" is liable to endanger the life of the patient, the administration of some anæsthetic is not only justifiable, but the neglect to use it, unless seriously objected to by the patient or his friends, would be highly reprehensible; or in cases of difficult parturition, where the pains and fatigues are more dangerous than the anæsthetic agent—and here I will remark parenthetically, that from the best information that I can gather on this subject, that patients already suffering severe pain are less liable to sink under the use of such agents, than under other circumstances—it ought not to be withheld. But, in the operation of extracting the teeth, I avoid them generally; and, indeed, in all cases, unless strongly urged, and for these reasons.

There is no serious danger from the shock of the operation; at the most, I have certainly never heard of death resulting as the immediate effect of extracting a tooth; and it is usually, when skilfully performed, an operation of very short duration.

Experience has proved that there is some danger from the use of some of the agents used to produce anæsthesia. Many lives have been lost, both in this country and in Europe, from the effects of chloroform. Sulphuric ether is disagreeable to some, very disagreeable to others, and to others again uncertain in its effects, producing only excitement without anæsthesia. I would sooner endure the pain of extraction than the discomfort of inhaling ether.

Probably very few persons operate as carefully, when their patients are under the influence of an anæsthetic, as when not, and for two reasons. First, they are likely to operate hurriedly, lest the influence of the anæsthetic pass off before the operation is completed; and, secondly, one is not apt to feel the same amount of responsibility and need of care when he knows his patient feels no pain, as under other circumstances; therefore accidents are more apt to occur with the use of these agents than without them.

Within the last few years various substances and appliances have been recommended, for the purpose

of producing "local anæsthesia." The most prominent of these are: chloroform, applied directly to the part; various freezing mixtures, similarly applied; and electricity. But for my own observation, and the best information I can obtain, they are not entitled to any serious consideration.

The smarting from the application of the chloroform is quite as severe as the pain of extraction, and is, therefore, at best, but a change of disagreeable sensations, a kind of translation of pains; if, indeed, it at all relieves the pain, and is not rather a smart, superadded to the pain.

The freezing mixtures are totally inadmissible in most cases, or except where the tooth to be extracted stands isolated from the rest, and they are always liable to produce severe injury, and even sloughing of the gums and surrounding parts.*

Electricity, in many cases where its use would be most desirable, only intensifies the pain; and in all the rest, probably only diverts the attention, by pro-

* I have quite recently been shown, by a dentist of Pittsburg, Pa., *a part* of an apparatus for conveying cold to a tooth, so as to prevent the sense of pain during extraction; which was *represented* to me as producing the effect most perfectly, and without any danger of accident from its use. But the apparatus being, as was alleged, about to be patented, and the holder being under bonds not to exhibit it till the patent was secured, of course I could not be favored with an exhibition.

ducing a different kind of pain from that of the operation to be performed.

Of all the agents used for producing insensibility to pain, at present known, chloroform and ether are probably the only two to be relied on,* and these

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* Since the publication of the first edition of this work, the use of protoxide of nitrogen or nitrous oxide has been revived as an anæsthetic, and has come into very general use. (It will be remembered, by those familiar with the history of anæsthesia, that Dr. Wells at first used the nitrous oxide for this purpose.) If the gas be pure, and properly administered, the results, to operators and patients, are very satisfactory. Without these precautions, dangers may be apprehended.

There are two methods in common use of administering it. One, and, as I think, the only true one, is by means of a double-valved mouthpiece, so contrived that the exhalations are thrown off, and not returned to the receiver. The other is by the use of an India-rubber bag, with a mouthpiece without valves; the exhalations being returned to the bag to be rebreathed. When this method is adopted, care should be taken that the bag be large—of the capacity of at least six gallons—or there will be danger of asphyxia from the inhalation of carbonic acid gas.

My attention was especially called to this danger in my own person, when I first commenced the use of this article; I was taking it then, to exhibit its effect. Not thinking of this danger, and not wishing to render myself very insensible, I took not more than three gallons, or less, in the bag. I very soon became insensible, and on returning to consciousness was told by the bystanders that my face became livid, and that I was convulsed, and clutched the bag so strongly that it required some force to remove it from my grasp. I immediately reasoned, that, as it is oxygen that gives the florid color to the blood, while carbonic acid gas turns it dark, it was from the effect of the carbonic acid gas that I had been made insensible.

Of its safety, with due observance of these cautions, I have no

only by producing general anæsthesia; and of these two, from its milder action and greater safety—

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doubt, as it has now been very extensively, and not always over-carefully, used, with but very few, if any, well-authenticated accidents having occurred. At one time I, myself, took it four times a day for six consecutive weeks; generally almost, and sometimes quite, to the point of insensibility; and with no other apparent effect than the naturally to have been expected one, of a slight diminution in flesh. As a curative agent it did not realize my hopes.

The advantages of nitrous oxide over other general anæsthetics now in use, are, that it has no unpleasant taste or smell, the somnolent state is quickly induced, without any stage of excitement, and then passes off quickly, so quickly that in the space of two or three minutes at most, all sensible effects either to bystanders or patient will be gone.

The principal disadvantages attending its use, are the greater expense and trouble of manufacturing it, and especially in small towns and villages where the demand is necessarily small. The short duration of its effects are sometimes an inconvenience to the dentist, as he cannot be operating while his patient is still inhaling the gas, as the general surgeon frequently can.

Another new method of producing *local* anæsthesia for extracting teeth, and performing other minor surgical operations without pain, has lately been introduced to the profession. This consists in passing a fine jet of ether upon the tooth, or other part to be operated upon. The ether is thrown into a fine spray, before reaching the part to be acted on, by means of a jet of atmospheric air. This causes so rapid evaporation as to produce freezing in a marvellously short space of time. With a newly discovered ether called Rhigoline this effect may be produced in from five to ten seconds, while with sulphuric ether nearly as many minutes will be required.

This invention has been received with considerable favor. Many operators speak highly in its praise.

The objections to its use seem to be that in the posterior part of

nearly if not quite all the lives that have been lost by them in this country, at least, having been from chloroform—I greatly prefer ether; though, what in some cases is better, and perhaps as good in all, is a mixture of the two, in about the proportion of four parts of ether to one part of chloroform.

The most convenient, and probably the safest way of administering either of them, is by saturating a napkin or a concave sponge with the material and holding it before the face, but not so closely at first as to exclude the free admission of atmospheric air from the lungs; meantime closely watching the effect, and if no untoward circumstances transpire, afterward bringing it closer and administering it more freely, but at no time entirely excluding the air; and so continue to administer it till the desired state of insensibility is produced.

If at any stage of the administration the patient begin sensibly to sink, as indicated by any material diminution, in either the force or frequency of the pulse, or of pallor of the countenance, the administration should immediately cease and restoratives be resorted to.* Of these, I have seen cold douches to

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the mouth its application is somewhat difficult. An unusual flow of saliva also impedes the freezing process.

Care should, no doubt, be taken not to carry the freezing process too far, lest sloughing be induced.

* These remarks will apply to the use of nitrous oxide and all other anæsthetics.

the head, volatile stimulants applied to the nose, and if the patient be not past the ability to swallow, a few drachms of brandy act very efficiently in restoring sensibility. In more urgent cases, electricity, insufflation, or other means of artificial respiration should be resorted to, and without delay. But with pure sulphuric ether, and with due care in its administration, very little danger need ever be apprehended.

I must here digress enough to say that in my unprejudiced opinion, formed from all the testimony that has been offered on the subject, the credit of introducing anæsthetics for the prevention of pain in surgical operations is justly due to the late Dr. Horace Wells, of Connecticut.

Before dismissing this subject, I cannot too strongly caution every one who administers either chloroform or ether, or any other *general* anæsthetic, and whether separately or mixed, against ever administering it to any female patient, except in the presence of some reliable third person. And, although, from my own knowledge and observation, I could offer reasons to enforce the necessity of this caution, the records of some of our courts of justice afford sufficient proof of its necessity without further argument.

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